

CURRENT SCIENCE

Vol. XI]

NOVEMBER 1942

[No. 11

	PAGE		PAGE
<i>The Manufacture of Glandular Products:</i>		<i>Letters to the Editor</i> ..	429
<i>The Organization of Our Slaughter Houses</i> ..	419	<i>Reviews</i> ..	445
<i>The Study of India by Russian Scientists in Post-Revolution Period</i> ..	421	<i>Indian Medical Gazette—Special Tuberculosis Number, October 1942</i> ..	447
<i>Blood Banks.</i> BY S. D. S. GREVAL ..	423	<i>Centenaries—</i>	
<i>Obituary—</i>		<i>Hoffmann, Friedrich (1660-1742)</i> ..	449
<i>Dr. Arnold Berliner (1862-1942)</i> ..	425	<i>Strutt, John William (1842-1919)</i> ..	449
<i>An Interspecific Hybrid in Sesamum—S. orientale L. × S. prostratum Retz.</i>		<i>Science Notes and News</i> ..	450
BY S. RAMANUJAM ..	426	<i>Errata</i> ..	452

THE MANUFACTURE OF GLANDULAR PRODUCTS: THE ORGANIZATION OF OUR SLAUGHTER HOUSES

THE chemist in this country who attempts work on glandular products, either for large-scale production in a factory, or for preparation on a small scale in the laboratory, is brought, sooner or later, inevitably to the realization that his raw materials, namely, the various animal glands, though potentially vast in quantity, are not available to him in the manner and form in which he would have desired to obtain them. While several hundreds of animals are killed daily in the slaughter houses of the cities in India, there is at present no provision made for facilities for the preservation of these glands in order that they might be worked up later, or be transported to a distant place where the central factory for the manufacture of the glandular hormones might be situated. The organizations which have been perfected in the abattoirs of Europe and the Packing Houses of America are, it is sad to state, conspicuous by their absence in India. Few of us are, perhaps, aware that the collection and

export of these tiny glands form the basis of a flourishing trade in South America, and still fewer realize that, even apart from such American firms as Park Davis Co., and others, some of the biggest pharmaceutical concerns in Great Britain are dependent to-day mainly on the countries across the Atlantic for their supply of raw materials for the manufacture of products like insulin, pituitrin, etc. The classical researches of Harington on the structure of Thyroxine might, perhaps, never have been accomplished but for the large amounts of raw materials in the shape of Thyroid glands supplied by the South American cattle yards. One of the chief secrets of this splendid organization in Europe and America lies in the high efficiency which has been attained in the technique of large-scale refrigeration. Insulated chambers, cooled by refrigerating machinery, are the essential features of all modern abattoirs. Immediately after the animals have been killed, the dressed carcasses are removed to

the cold rooms. They are kept there for several hours during which all the endocrine glands are removed neatly under expert supervision. They are then frozen and conveyed immediately in iced and insulated trucks to local firms, if there are any, or packed into large refrigerated chambers in ships which take them all the way across the Atlantic. In our country, on the other hand there are, I believe, no slaughter houses which can boast of insulated cold rooms. The result is that there is little time available for the selection and removal of the glands which, in several cases, have their potent principles destroyed to a large extent even by an hour's delay of removal, due to the setting in of autolysis. To give only one example in illustration, we may consider the case of Madras City where cattle are slaughtered in the evening and the meat sold in the bazaars only the following morning. If one wants to work with the pituitary glands, he has to break open the skulls within half an hour of killing the animal and carefully scoop out the tiny glands from the sphenoid cavity of the brain—a treatment which renders the brain unfit for consumption the next morning, since putrefactive changes set in almost instantaneously. If, on the other hand, our slaughteries had been furnished with suitable refrigeratory systems, these brains, after removal of the pituitaries, could easily have been kept frozen without the slightest deterioration, or loss of freshness until the next day for consumption by the public. From the fact that in some of the coastal parts of India, fish is being successfully refrigerated and supplied in a fresh condition to interior parts, it will be evident that the introduction of refrigerated chambers in

the slaughteries would permit a similar transport of meat in perfect conditions of freshness and flavour from the larger cities to the interior parts. It may, of course, necessitate a rather large initial outlay, but, since electric power is not expensive, particularly in those parts of India where hydro-electric installations have been established, such a practice is certain in the long run to prove to be of great commercial benefit. The matter is obviously for the consideration of the Provincial Governments in India, and of the authorities of our City Corporations and I do hope it will receive the serious attention of these authorities and the public without delay.

A word in this connexion about the methods of killing animals in our abattoirs may not be out of place. Cattle and sheep are, as a rule, not stunned as is the humane practice adopted in the abattoirs of Europe and America; on the contrary, the animals are almost always subjected to the horrible sights and smells of the slaughter house, and they often witness the sufferings of their fellows. One of the most important glandular products, Adrenaline, is known to be the hormone of emergency, and it is not at all improbable that in the struggle of the animals during the few minutes immediately preceding death, a considerable portion of the stock of this hormone in their glands finds its way into the blood stream, and is thereby lost. In introducing reforms in these wasteful practices, it is necessary not only to rouse the public conscience but also to have the intelligent co-operation of some of the meat-eating communities in India in bringing about the necessary relaxation of their religious scruples.

B. B. DEY.

THE STUDY OF INDIA BY RUSSIAN SCIENTISTS IN POST-REVOLUTIONARY PERIOD

[Extracts of a message received by Sir C. V. Raman, Kt., F.R.S., N.L., President,
Indian Academy of Sciences, from the Soviet Scientists Committee, U.S.S.R.]

PRE-REVOLUTIONARY Russian indology is the indology of the Nineteenth and the beginning of Twentieth century and has many a brilliant page recorded in its history.

In the Nineteenth century, the Russian Academy of Sciences completed a number of important scientific investigations in this respect, and published the well-known unabridged St. Petersburg edition of Samskrit dictionary and the no less important abridged edition. It also issued a number of scientifically important ancient Indian manuscripts in original and in translations.

Professor Minayev's ideas were more or less consistently developed by his pupils and followers like Professor D. Kudryavsky and academicians Oldenburg and Scherbatsky.

Professor Kudryavsky was a linguist and specially compiled a Samskrit grammar and conducted a number of valuable investigations in ancient Indian Philosophy. Of particular importance was his research relating to ancient Indian rituals.

The scientific endeavours of academician Oldenburg (1934) embraced a wide and varied range of topics. It involved the publication of a number of Samskrit manuscripts in the field of ancient Indian and mediæval Samskrit literature, folklore, history, archæology and culture of India. His main endeavours relate to the study of Buddhism and influence Indian culture on the culture of the peoples of Central Asia and the Far East. Of great value is his description of the Buddhist collections of Hara Hoto gathered by P. K. Kozlov.

Continuing the traditions of the eminent scholar of Buddhism academician Vasilyev, Scherbatsky (1866-1942) devoted himself wholly to the study of Buddhism, particularly Buddhist logic on basis of Samskrit and Tibetan sources. Scherbatsky's voluminous research in the field of Buddhist logic was published in Russian and English languages and represents a valuable contribution to the history of Indian Philosophy. An addition to the theoretical works and

translations from Samskrit and Tibetan languages, academician Scherbatsky published a number of important monumental works of philosophy in Samskrit and Tibetan tongues.

Academicians Oldenburg and Scherbatsky edited *Bibliotheca Buddhica* series published by the Academy of Sciences. This series includes contributions from a number of Eastern and European scientists.

Thus, immediate pupils and successors of Professor Minayev in St. Petersburg University, did not succeed in fulfilling his wish of extending scientific studies to modern Indian languages and literature and create a basis for an extensive study of India's history. This was done after the October revolution which has given a new spur to developments in every field of science. Russian public has been manifesting profound sympathy for the Indian people, evincing great interest in Indian culture and literature.

Indicative of this is the tremendous popularity among broad sections of public of the works of Indian authors, particularly Rabindranath Tagore. Scores of his works have been translated into Russian.

This exercised important influence on the development of Soviet Indology. While the older generation of Russian indologists as academicians Oldenburg and Scherbatsky and their pupils successfully continued their study of Samskrit and Buddhist culture, the younger generation concentrated its attention on the study of modern Indian languages and literature as well as a study of India's history.

In this way Soviet scientists began to draw upon a greater number of sources and laid the foundation for a truly historical study of the Indian languages and literature in U.S.S.R. Soviet scientists raised indology to equal importance with other branches of philology.

From the early days of its development, modern Indian philology has manifested a tendency to consolidate this development

by creating independent traditions. Grammars and text-books for studying modern Indian languages appeared and a number of works of contemporary authors published. Leningrad Eastern Institute published grammars and other handbooks for study of Hindi and Urdu by Barannikov, for Marathi language by Barannikov and Krasnodembsky and for Bengali language by Zimin and others.

Since dictionaries of modern Indian languages become quite out of date and poorly reflected the present state of the various new Indian languages whose vocabulary is getting tremendously enriched, Eastern Institute of Academy Sciences set itself the task of compiling new dictionaries of the most important contemporary Indian languages, Hindi, Urdu, Bengali and Marathi. Along with compilation and publication of dictionaries, Eastern Institute conducts theoretical work in linguistics relating to complex verbs (Barannikov, Zimin, Krasnodembsky) to science structure of modern Indian languages (Krasnodemsky and Beskrovny) to principles formation and terminology in modern Indian languages (Beskrovny and others) and to complex word formations (Kalyanov).

Great number of European scholars and even some Indian scientists who do not specially engage themselves in a study of the history of modern Indian literature consider it an axiom that contemporary Indian literature is merely a "reflection of Sanskrit literature". This is an alleged admission that, since India's subordination to Moslems from beginning of second century, our Era, Indian peoples have not produced any major original works which could be considered as a contribution to world literature.

Closer acquaintance with the monumental works of modern Indian literature shows this view to be entirely incorrect, for although Sanskrit literature and modern Indian folklore are frequently identical as regards names, topics and plots, the works and characters created in modern Indian languages quite frequently differ from the works and characters of Sanskrit literature. Similarly they differ as regards form and poetic expressions. Russian scientists have proved this by concrete facts. For example, Barannikov's book "Legends about Krishna" shows that even works closely similar in contents as for example ten volumes of "Bhagavata Purana" and "Prem Sagar Lallu

Ji Lalha" (latter ordinarily considered translation of former) present entirely different characters of Krishna who is the hero of scores of works in Indian literature.

With even greater conviction, the original and unique character of new Indian literary traditions is revealed in the work of the same author based on research on Ramayana by Tulasidas, translation of which into Russian is nearly completed. Works of Russian scientists in the field of the history of India and history of Indian literature are closely connected with major endeavours initiated by the Academy of Sciences: "World History" and "History of World Literature".

Great impetus is lent to study of India's history and history of Indian literature by inclusion of modern history of East in the curricula of the history departments at all Universities and pedagogical schools. In addition to the most important modern Indian dialects and their respective literatures, Russian Indologists are studying one of the languages of the Indian system, viz., Gypsy Language.

In pre-revolutionary Russia, just as in other countries study of Gypsies was frequently left to amateurs. During Soviet period Russian Indologists produced a number of scientific works which shed light on the history of these people in our country, their language and creative endeavours.

Mass work accomplished in U.S.S.R. in creating alphabets for small nationalities in our country which lacked their own written language in the past, also resulted in producing written language for Gypsies. Gypsy schools were supplied with text-books for all elementary subjects. Grammar of Gypsy language compiled by Professor M. Sergievsky is based on dialect of Moscow Gypsies. Considerable attention has also been paid to a study of other Gypsy dialects, particularly that of Gypsies residing in Ukraine fields, formerly considered completely outside the realm of science. As a result of this study, a number of works have been produced in Russian, Ukrainian and English languages, as for example, Barannikov's "Ukrainian and South Russia Gypsy Dialects". In addition to research in dialectology, these works contain considerable number of records of Gypsy texts and translations into respective languages. Number of Gypsy songs and their translations into English are published in British Magazine *Gypsy Lore Society*.

BLOOD BANKS

BY

S. D. S. GREVAL

(Indian Military Hospital, Nowshera)

WHAT THEY ARE

BLOOD taken from a healthy subject [DONOR]* with precautions assuring exclusion of germs can be kept from clotting (by addition of 0.3 per cent. sodium citrate) and almost fresh (at 2-8° C.) for at least ten days (longer, if glucose is also added). Institutions keeping a stock of bottles of blood so preserved are known as Blood Banks. This preserved blood can be injected into the veins [TRANSFUSED] of a patient [RECIPIENT] in most cases of disease and injury like freshly drawn blood.

The significance of the term 'bank' lies in the fact that the blood can be deposited for future use by the recipient himself (under certain conditions) or his relations and friends. Usually it is donated by voluntary donors, public spirited or paid. In Russia it has been collected from dead bodies. Placental blood (in child birth) has also been advocated. The last two sources are messy and uncharitable (placental blood is baby's blood) to say the least. Given proper organisation there is no dearth of healthy blood from voluntary donors in any part of the world.

The Blood Banks are of Russian and American origin. Most of them only stock blood which can be given without any tests to recipients of all blood groups [blood from UNIVERSAL DONORS. For the Blood Groups and Blood Types see Table and also a previous article in this *Journal*, included in the list of useful Reference].

The Banks contemplated in England at the beginning of the War were also of this kind. In the Red Cross Blood Bank of Calcutta, started by the writer in 1939, blood of all groups was kept in addition to the blood of universal donors.

The ideal blood to transfuse should be of the same group and the same type as the recipient's blood. The determination of the type, however, is a laborious procedure. For all practical purposes, therefore, the blood of the same group is considered a good substitute. Failing this degree of similarity of blood the red corpuscles of

which are not affected [broken up LYSED, or stuck together AGGLUTINATED] by the straw coloured watery part of the recipient's blood [PLASMA and SERUM] is considered suitable [COMPATIBLE, though in one aspect only]. The Universal donor's blood is regarded as a blood of this kind for subjects of all other groups. So are the bloods of groups A and B for a recipient of group AB [UNIVERSAL RECIPIENT]. This liberty taken in transfusion occasionally results in serious reaction and even death. These are caused by high potency of the antisubstances [ISOHÆMAGGLUTININS *a* and *b*, ISUNINS *a* and *b* of the writer] in the in-going plasma of the 'compatible' donor against the group specific substances [ISOHÆMAGGLUTINOGENS A and B, ISOGENS A and B of the writer] in the recipient's red blood corpuscles. Standards of safety have been worked out and should be followed.

A PLASMA BANK

The preserved blood lying in bank does not clot but separates into a top layer of straw coloured plasma and a bottom layer of granular looking semisolid red blood corpuscles. The corpuscles grow more fragile with storage and can be discarded before they have started to tinge the plasma, when the blood has not been used up within the agreed period (ten days). The plasma is pipetted off (with precautions assuring exclusion of germs) and stored as such. It keeps good for at least two months. The institution storing plasma only is a Plasma Bank.

In cases of sudden bleeding caused by accidents, battles and Air Raids, plasma has its use. In fact in such cases it is preferable to the whole blood. The same applies to cases of extensive burns. In these injuries more plasma is lost from the body than the red blood corpuscles. Giving of whole blood may increase the total volume of the latter to such an extent, as to make the blood in the system sticky and thus impede the circulation.

For stopping bleeding, providing ready-made human material for repair of the system and supplying natural protective substances of the humour against infection, the plasma is as good as whole blood.

* Technical terms, self-explanatory in the context, are given in CAPITALS in square brackets

The plasma is not kept in a bank group by group. It is made safe for transfusion into recipient of any group by reducing its potency of the antisubstances. This is done by pooling, absorption (with the group specific substances) or merely by dilution with isotonic solution of sodium nitrate [NORMAL SALINE, the product then is called plasma-saline]. The natural distribution of blood groups in India is such (O A and B are more evenly distributed than in England) that pooling tends to ensure safety. The pooled plasma, however, must be tested. It should conform to the standards laid down for the plasma of the 'safe' universal donor.

For slow loss or deterioration of blood caused by disease, plasma cannot replace whole blood in transfusion.

Plasma banks are also blood banks inasmuch as the plasma is an important and integral part of the blood. They are, however, second best, taken all round.

Antiseptics can be added to preserved plasma. 'Merthiolate' is the antiseptic of choice.

A SERUM BANK

Blood to which no sodium citrate (or another chemical with a similar property) has been added clots in a few minutes. Later the clot contracts and from its meshes is squeezed out a straw coloured fluid, the serum. The serum is also stored and used like plasma. The institution storing serum only is a Serum Bank.

A physiological difference between the plasma and the serum is that while the former is capable of clotting like the whole blood, on the addition of calcium salts, the latter is not. The plasma clot of course lacks the red colour due to the lack of red blood corpuscles. A therapeutic and rather important difference is that, in the experience of some workers, human serum is toxic. A physical difference is that the serum is easier to filter through germ-removing filters than plasma. In other respects the plasma and the serum may be taken to be identical.

It will be observed that while a plasma bank can be run as a side-show from a real blood bank, a serum bank takes blood initially for serum and discards useful constituents of it.

Serum banks are also blood banks inasmuch as the serum is an important fraction of blood. Taken all round, however, they can be assigned only the third place.

DRIED PLASMA AND SERUM

Both these fractions of blood can be dried, sealed hermetically and stored almost indefinitely. Addition to the dry powder of the calculated quantity of distilled water provides in a few moments liquid plasma or serum ready for transfusion. The drying, unfortunately, is done by the aid of expensive machinery. The fluid must be frozen and dried from the frozen state. Products obtained by other means are inferior, unreliable and dangerous.

CONCENTRATED PLASMA (AND SERUM)

The plasma can be concentrated (to a quarter to fifth of its volume), in a sterilized cellophane bag by the simple act of

A Table explaining the Serological Constitution of Blood Groups and giving Old Equivalents of New Terms

Substance in red blood corpuscles, isogen (=isohæmagglutinin)	Anti-substance in plasma, isonin (=isohæmagglutinin)	Designation of blood group in International Nomenclature	Designation of blood group in Old Nomenclature
O (= nothing, capital letter)	ab	O*	Jansky I* Moss IV*
A	b	A	II
B	a	B	III
AB	o (= nothing small letter)	AB†	IV† I†

* Is "universal donor". Red blood corpuscles cannot be agglutinated by plasma from other groups. But plasma of high titre can kill recipients of all other groups.

† Is "universal recipient". Plasma cannot agglutinate red blood corpuscles from other groups. But high titre plasma from donors of all other groups can kill the recipient.

exposing the bag to air. The concentrated product keeps for a year or so. It takes up distilled water (four to five times or more of its volume) and provides in a few moments liquid plasma or serum ready for transfusion.

Concentration of plasma (and serum) has not found favour with the workers who have been put in charge of blood banks in India, lately. The experimental work on revival of dogs suffering from loss of blood, however, was carried out exclusively by concentrated dog serum, many years ago, in America.

Division of A into A₁, A₂ and A₃ provides sub-groups A₁, A₂, A₃, A₁B, A₂B and A₃B.

The sub-groups, however, have no importance in transfusions of blood.

Hæmagglutinin (not isohæmagglutinin) M and N provide further differentiation. Each group and sub-group is of M, N or MN type. The types may have a place in transfusion specially in repeated transfusions.

A LIST OF USEFUL REFERENCES

The titles of the following papers, published during the last three years, indicate the subjects investigated and discussed and will provide the necessary details of procedure which have been kept out of the general account given in this communication.

- (1) On M and N in Blood Groups: Technique of Typing, Anti-fluids, Findings in 300 Indians and Associated Considerations. By S. D. S. Greval, S. N. Chandra and L. S. F. Woodhead, *Ind. Journ. Med. Res.*, 26, April 1939.
- (2) The use of Blood Tests in Excluding Paternity and Maternity. By S. D. S. Greval, *Ind. Med. Gaz.*, 75, July 1939.
- (3) Difficulties and Dangers in Providing Donors of Blood. By S. D. S. Greval and S. N. Chandra, *Ind. Med. Gaz.*, 74, August 1939.
- (4) Taking Blood for Transfusion. By S. D. S. Greval and S. N. Chandra, *Ind. Med. Gaz.*, 75, January 1940.
- (5) The Needle in the Vein. By S. D. S. Greval, *Ind. Med. Gaz.*, 75, February 1940.
- (6) Blood Groups of Communities in Calcutta. By S. D. S. Greval and S. N. Chandra, *Ind. Journ. Med. Res.*, 27, April 1940.
- (7) The use of Blood Tests in Excluding Paternity and Maternity (with a note for non-medical readers). By S. D. S. Greval, *Burma Police Journal*, 3, July 1940.
- (8) Taking Blood for Transfusion (in Potain's Aspirator). Further Details including Cold Storage. By S. D. S. Greval, S. N. Chandra and A. B. Roy Chowdhury, *Ind. Med. Gaz.*, 75, September 1940.
- (9) Blood Groups and Blood Types. By S. D. S. Greval, *Current Science*, November 1940.
- (10) Making Plasma Safe for Transfusion. By S. D. S. Greval, *Ind. Med. Gaz.*, 75, December 1940.
- (11) On Isohæmagglutination: Nomenclature, Titration of Isohæmagglutinins, Need for Revision of Technique of Grouping Blood, etc. By S. D. S. Greval, S. N. Chandra and L. S. F. Woodhead, *Ind. Journ. Med. Res.*, 29, January 1941.
- (12) Obtaining Compatible Blood Exchange and Associated Considerations. By S. D. S. Greval, *Cal. Med. Journ.*, 38, 79-83, February 1941.
- (13) Taking Blood for Transfusion: Further Improvisations. By S. D. S. Greval, S. N. Chandra and D. N. Chatterji (in press) *Ind. Med. Gaz.*
- (14) An important Anti-genic Difference between Hæmagglutinogens M and N. By S. D. S. Greval and S. N. Chandra (in press), *Ind. Journ. Med. Res.*
- (15) A Note on Blood Transfusion Services of Calcutta (Organisation, Routine and Research). By S. D. S. Greval, and S. N. Chandra. A Government of Bengal Publication, 1941.

OBITUARY

DR. ARNOLD BERLINER (1862-1942)

WE deeply regret to record the death of Dr. Arnold Berliner at the age of eighty. He is well known throughout the world of science as the Founder and until 1935, the Editor of *Naturwissenschaften*. In July 1935, Dr. Berliner, at the special invitation of the Board of Editors, *Current Science*, accepted the position of one of the Corresponding Editors. His association with *Current Science* has been eventful; he was responsible for the suggestion that

Current Science should undertake the publication of special supplements dealing with the most outstanding topics of science. The supplements so far issued on Laue Diagrams, Canal Rays, Genetics, and Organisers in Animal Development are largely the direct consequence of his enthusiastic, generous and whole-hearted co-operation.

In his death, *Current Science* loses one of its highly esteemed and valued well-wishers.

AN INTERSPECIFIC HYBRID IN SESAMUM

S. ORIENTALE L. \times *S. PROSTRATUM* RETZ.

BY
S. RAMANUJAM

(Imperial Agricultural Research Institute, New Delhi)

INTRODUCTION

THE genus *Sesamum* is known to be represented in India by three species,¹ viz., *S. orientale*, *S. prostratum* and *S. laciniatum* Klein, of which the first-named species is grown widely as an important oilseed crop all over India and in other tropical countries; it has also been collected in the wild state round about Delhi and Dehra Dun.² The other two species are closely allied and have been found to grow wild in South India

At the Imperial Agricultural Research Institute where a collection of wild relatives of crop plants is being built up and studied in search of favourable genes for utilisation in breeding, *S. prostratum* collected from Madras was found to grow vigorously and remain practically unaffected by the pest and the disease. It has now been grown at the Botanical Section of the Institute for two years along with several types and the wild forms of the cultivated species, and



(a) *S. orientale*

(b) *S. prostratum*

(c) Hybrid

FIG. 1

especially on sand hills. The cultivated species is usually subject to a bad attack of a caterpillar, *Antigastra catalaunalis*, in the early stages and to what is believed to be a virus which reduces the floral organs to leafy structures, in the later stages of the crop. The caterpillar has been reported to be a bad pest on this crop in Madras³ doing considerable damage and the virus disease variously designated as sepaldoidy,^{4,5,6} phylodoidy^{7,8} and 'green-leaf' disease,⁹ has also been known to cause appreciable reduction in yields wherever the crop is grown. At Delhi, our experience has been that it is almost impossible to raise a good crop of this species owing to the ravages of this pest and this disease.

found to be absolutely free while all the latter were badly attacked by the pest and the virus. The caterpillars when artificially made to feed on the *prostratum* plants did little damage and the affected plants recovered remarkably from the minor injuries inflicted on them. As regards virus symptoms, not even a trace was noticed on these plants during the two years and grafting experiments are under way to confirm their immunity to the disease. Another desirable point about *prostratum* plants is that they are likely to be drought-resistant inasmuch as they are known to inhabit sandy tracts. Experiments have also been put on hand to test the relative drought resistance of this wild and the cultivated species.

The chromosome number of *S. prostratum*¹⁰ was determined by the author to be $n = 16$ while that of *S. orientale*¹¹ is known to be $n = 13$. The oil content of the seeds

of the former species was kindly determined by the Imperial Agricultural Chemist to be 32 per cent. while that of the latter is known to range from 45 to 55 per cent.

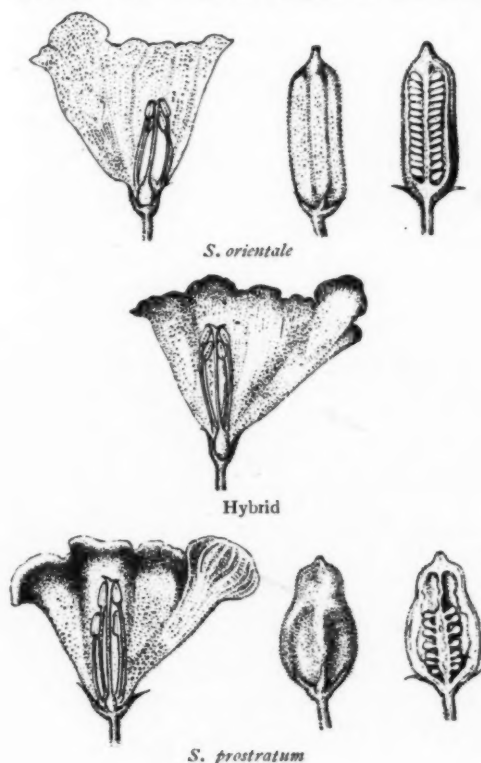
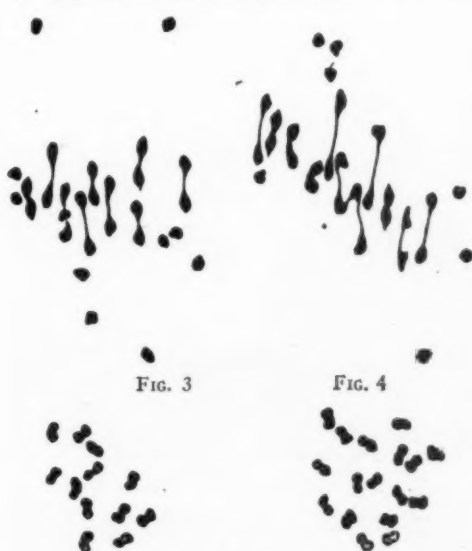


FIG. 2
Flowers and Fruits



HYBRIDISATION

With a view to eventually evolving an economic type of *Sesamum* resistant to the pest and the disease and possibly also to drought, crosses were attempted between *S. orientale* (I.P. 6) and *S. prostratum* reciprocally during the season of 1941. Setting was fair in the crosses and out of 91 crossed seeds sown during 1942, 11 hybrids from

Details of characters	<i>S. orientale</i> (I. P. 6)	Hybrid	<i>S. prostratum</i>
Habit	Erect	Semi-erect	Prostrate
Leaves	Petiolate, oblong to ovate, lower divided and upper simple with almost entire margin	Petiolate, and simple throughout with imperfect lobation in a few of the basal leaves	Short petioled, simple orbicular with crenate margin
Inflorescence	Raceme, flowers solitary, axillary with two discoid gland-like structures representing rudimentary flowers	Raceme, flowers solitary, axillary with imperfectly developed glandular structures	Raceme, flowers solitary, axillary with no rudimentary structures
Flowers	Pedicellate, bracteate, zygomorphic, hermaphrodite with very light purple corolla	Pedicellate, bracteate, zygomorphic, hermaphrodite with light purple corolla	Pedicellate, bracteate, zygomorphic, hermaphrodite with purple corolla
Fruit	Capsule four-chambered, quadrangular, opening from above loculicidally down to about the base	No fruits were formed as the gametes were sterile	Capsule ovoid compressed with tough pericarp, opening loculicidally from top to only a short distance below
Seeds	Many, white, smooth with thin testa	—	Fewer, black, deeply reticulate with thick testa

the direct cross and 2 from the reciprocal were obtained. The hybrids grew well and flowered profusely.

MORPHOLOGY AND CYTOLOGY OF THE HYBRIDS

The hybrids were intermediate in respect of several characters of the parents, but showed dominance with regard to resistance to the pest and to diseases. The following is a comparative statement of some of the more important characters of the parents and hybrids. There was no essential difference between reciprocal hybrids.

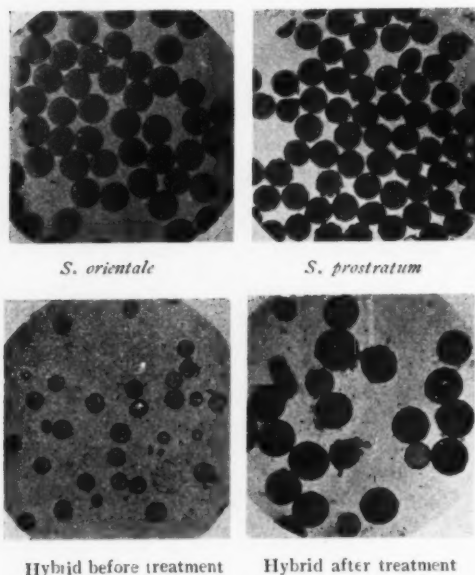


FIG. 6
Pollen Grains

Fig. 1 is a photograph showing the habit of the two parents and a hybrid plant; Fig. 2 represents their floral parts and fruits.

The hybrids, in spite of profuse flowering proved to be practically sterile and set no fruit which was not surprising considering the differences in morphology and in chromosome number between the parental species. An examination of the pollen meiosis in the hybrids showed 29 chromosomes, i.e., a number equal to the sum of the gametic numbers of the two parents. At metaphase I in the hybrid, the chromosomes usually formed varying numbers of bivalents and univalents; occasionally a quadrivalent or a trivalent was also met with in some cells. The maximum number of bivalents

noticed in any one cell was eleven. Figs. 3 and 4 represent two metaphases with $9 + 11$ and $1 + 9 + 7$ respectively. Anaphase separation was irregular followed by an equally irregular second division which resulted in the abortion of most of the gametes. Fig. 5 shows a distribution of chromosomes at metaphase II. Back-crossing of the hybrids with the parents failed to produce fruit formation.

COLCHICINE-TREATMENT OF HYBRIDS

With a view to doubling the chromosomes in the hybrid for obtaining a fertile amphidiploid for further work, a number of vegetative buds in a few hybrids were treated with 0.4 per cent. aqueous solution of colchicine. The alkaloid was sprayed on the buds twice daily at 9 a.m. and 4 p.m. on three alternate days. The treated buds developed slowly and showed all the symptoms of induced polyploidy; the leaves were thicker and the flower buds and flowers bigger and more hairy than those of the untreated plants. The pollen of some of the treated plants showed a remarkable change; most of them were bigger and full of contents as compared to the shrivelled and empty grains of the untreated hybrids. In Fig. 6 are shown photographs of the pollen of the two parents and the hybrid before and after treatment with colchicine. As would be expected, many of the treated branches in which flowers with good pollen have been found, are developing capsules. There is no doubt that fertility has been induced in the sterile hybrid as a result of chromosome doubling which is evidenced by the bigger and more numerous functional pollen grains produced. The progeny of this newly-produced double-diploid hybrid is expected to provide material of interest both from the point of view of theoretical and practical genetics.

- ¹ Hooker, J. D., *Flora of British India*, 1885, **4**, 387.
- ² Unpublished Records of the Imperial Agricultural Research Institute, New Delhi.
- ³ *Rep. Agric. Sta., Malras*, 1939-40, 1940-41.
- ⁴ Kashi Ram, *Mem. Dep. Agric. India Bot.*, 1930, **18**, 127.
- ⁵ Richbaria, R. H., *Nagpur Agri. Coll. Mag.*, 1936, **9**, 61.
- ⁶ Roy, S. C., *Agric. Live-Stk. India*, 1931, **1**, 182.
- ⁷ Pal, B. P., and Pashkar Nath, *Indian J. Agric. Sci.*, 1935, **5**, 517.
- ⁸ Rhind, D., *et al.*, *Ibid.*, 1935, **7**, 823.
- ⁹ Robertson, H. F., *Rep. Mycologist, Burma*, 1928, **5**.
- ¹⁰ Ramanujam, S., *Curr. Sci.*, 1941, **10**, 439.
- ¹¹ Morinaga, T., *et al.*, *Bot. Mag., Tokyo*, 1929, **43**, 512.

LETTERS TO THE EDITOR

	PAGE		PAGE
Effect of Temperature on the Dissociation of Strong Electrolytes by Raman Effect. BY N. RAJESWARA RAO	429	Further Studies on the Role of Protozoa in the Activated Sludge Process. BY S. C. PILLAI	437
Darcy's Law and Upward Movement of Water in Soil. BY D. S. KOTHARI AND F. C. AULUCK	430	Germination of Ergot. BY A. B. BOSE ..	439
Coefficient of Expansion of Solids. BY M. RAMA RAO	430	The Eggs and Embryos of <i>Gegenophis carnosus</i> Bedd. BY B. R. SESHACHAR ..	439
Deterioration of Ergometrine Solution. BY N. K. DEY, I. B. BOSE AND B. MUKERJI ..	432	A New Nematode <i>Camallanus salmonæ</i> from Kashmir. BY G. K. CHAKRAVARTY ..	441
Three New Species of <i>Riccia</i> from India. BY S. AHMAD	433	State of Chlorophyll in the Chloroplast. BY B. N. SINGH AND N. K. ANANTHA RAO ..	442
Pink Coloured Mutant in <i>Salvia coccinea</i> Jess ex Murr. BY L. S. S. KUMAR ..	434	Variation in the Rate of Elongation of the Coleoptile of <i>Zea mays</i> . BY C. V. KRISHNA IYENGAR	443
Standardization and Potency of Adrenaline Solutions. BY B. C. BOSE, N. K. DUTT AND B. MUKERJI	435	Manufacture of Glandular Products in India: Preparation of Adrenaline from Suprarenal Glands. BY B. B. DEY ..	444

EFFECT OF TEMPERATURE ON THE DISSOCIATION OF STRONG ELECTROLYTES BY RAMAN EFFECT

THE temperature dependence of the extent of dissociation of some strong electrolytes is studied by comparing the intensities of the Raman lines characteristic of the ions and the undissociated molecules in the Raman spectra of these substances at different temperatures. It is well known that the Raman lines of frequencies 910, 980 and 1045 in the Raman spectra of solutions of H_2SO_4 are characteristic of H_2SO_4 molecules, SO_4 and HSO_4 ions respectively, while HNO_3 molecule and NO_3 ion in solutions of nitric acid are represented by the Raman lines 1300 and 1040 and IO_3 ion and HIO_3 molecule give rise to Raman lines of frequencies 810 and 825. The following observations are made regarding the change in the relative intensities of these lines with increase of temperature.

(1) In all the cases dealt with in the present investigation, it is found invariably that on increasing the temperature, the lines characteristic of the ions decrease in intensity compared to those representing the undissociat-

ed molecules, thereby showing that the dissociation of these substances decreases with temperature.

(2) On examining the intensities of the lines characteristic of HNO_3 , NO_3 , H_2SO_4 and HSO_4 in solutions of nitric and sulphuric acids, it is found that the decrease in the intensity of the lines representing the ions compared to those characteristic of the undissociated molecules is less conspicuous as the concentration of the solution is decreased, thereby indicating that the rate of decrease of dissociation with temperature is smaller as the solution is diluted.

(3) But in the case of dissociation of HSO_4 into H and SO_4 in solutions of dilute sulphuric acid and bisulphates, and of HIO_3 into H and IO_3 in solutions of iodic acid, investigations similar to those made in (2) revealed that the rate of decrease of dissociation with temperature is larger as the solution is diluted.

It may also be observed in this connection that the substances referred to in (2) rapidly dissociate with addition of water, while those in (3) dissociate very slowly and are found to contain undissociated molecules even in very

dilute solutions, as described in the previous papers published by the author.^{1,2,3}

More work is in progress to arrive at an explanation of the above results.

N. RAJESWARA RAO.

Andhra University,
Guntur,
September 9, 1942.

¹ N. R. Rao, *Ind. Journ. Phys.*, 1940, **14**, 143.

² —, *Ibid.*, 1941, **15**, 185.

³ —, *Ibid.*, 1942, **16**, 71.

DARCY'S LAW AND UPWARD MOVEMENT OF WATER IN SOIL

In an interesting paper Ramdas and Malik¹ give an account of their recent studies on the upward movement of water and salt solutions in the black cotton soil. The rate of ascent of water in vertical glass tubes packed with soil was determined. The rate of ascent is at first rapid and then gradually falls off with time.

It seems worthwhile to point out in this connection that the relation between h and t , where h denotes the height upto which water rises in the tube in time t , can be immediately derived by an obvious application of Darcy's Law governing the flow of a fluid in a porous medium and the experiments of Ramdas and Malik can be used to find the permeability coefficient of the soil. Let h_0 denote the maximum height to which water rises in the tube (i.e., $h \rightarrow h_0$ as $t \rightarrow \infty$), then the pressure forcing the water upwards at time t , when the height of the water level in the tube is h , will be $(h_0 - h)g\rho$, ρ being the density of water. Hence according to Darcy's Law the velocity v of flow will be given by

$$v = \frac{dh}{dt} = \frac{K}{\mu} \frac{(h_0 - h) g \rho}{h} \quad (1)$$

$$\text{or } t = \frac{\mu h_0}{Kg\rho} \left\{ \log \frac{h_0}{h_0 - h} - \frac{h}{h_0} \right\}, \quad (2)$$

where K is called the permeability coefficient, and μ is the viscosity of water. (It may be noted that for the flow of water in a capillary tube of radius a , K will be $\frac{a^2}{8}$). The experimental curve of Ramdas and Malik agrees with

the relation (2) for $K = (4.68 \pm 5)$ milli-Darcys. These experiments, therefore, provide a method for determining the permeability coefficient of soils.

D. S. KOTHARI.

F. C. AULUCK.

Department of Physics,
University of Delhi,
November 13, 1942.

¹ L. A. Ramdas and A. K. Malik, *Proc. Ind. Acad. of Sci.*, 1942, **16**, 1.

² Musket, *The Flow of Homogeneous Fluids through Porous Media*, Chapter II (McGraw Hill, 1937).

COEFFICIENT OF EXPANSION OF SOLIDS

THE model of the solid body which is the basis of the atomic heat theories of Einstein, Debye and Born-Karman is highly idealised. This idealised solid body has, as is easily seen, a zero coefficient of expansion. In order to explain the expansion of a solid, Debye assumed a law of force involving higher powers of the variation of the atomic distance. This extension gives the law deduced by Gruneisen¹ that at sufficiently low temperatures the coefficient of thermal expansion α is proportional to the specific heat C_v .

The coefficient of volume expansion α is given by the relation

$$\alpha = \frac{1}{V} \left(\frac{\partial V}{\partial T} \right)_p = \beta \theta \left(\frac{\partial}{\partial V} \right)_T \int_0^T \frac{C_v}{T} dt.$$

If we assume that C_v is a function of $\frac{\Theta}{T}$, where $\Theta = \frac{h\nu}{k}$ after Debye or Einstein, then

$$\begin{aligned} \alpha &= -\frac{\beta \theta}{V} \frac{\partial \log \Theta}{\partial \log V} C_v \\ &= \frac{\beta \theta}{V} C_v \gamma, \end{aligned}$$

where $\beta \theta$ = isothermal compressibility

$$\gamma = -\frac{\partial \log \Theta}{\partial \log V}.$$

It is well known that the Debye formula fails to represent the specific heat curves correctly in several cases. Elaborate hypothesis have been put forward to explain away these failures. According to Raman² the vibration

spectrum of every crystal, however simple in its chemical composition, includes several monochromatic frequencies lying in the infra-red or high frequency region. This is accompanied in the region of low frequencies by a continuous spectrum of elastic vibrations. The contribution of the latter to the thermal energy would be relatively of minor importance for the vast majority of crystals except at the lowest temperatures. When these monochromatic frequencies are known, the specific heat formula necessarily contains corresponding Einstein terms. Thus in the specific heat theory developed by Raman

$$C_v = w_1 C_{v1} + w_2 C_{v2} + w_3 C_{v3},$$

where w_1, w_2, w_3 are the weight factors depending on the nature of the crystal and C_{v1}, C_{v2} and C_{v3} are Einstein functions corresponding to the monochromatic frequencies ν_1, ν_2, ν_3 , etc. On the basis of this theory the coefficient of volume expansion of a crystal is given by

$$\alpha = -\frac{\beta\theta}{V} \left\{ w_1 C_{v1} \frac{\partial \log \Theta_1}{\partial \log V} + w_2 C_{v2} \frac{\partial \log \Theta_2}{\partial \log V} + w_3 C_{v3} \frac{\partial \log \Theta_3}{\partial \log V} \right\}$$

The factors $\frac{\partial \log \Theta}{\partial \log V}$ give the dependence of the vibrational frequencies on the volume of the crystal. For quasi-harmonic vibrations it is an index of the relationship between the amplitude of vibrations and the volume of the crystal. The factors C_{vi} , etc., give the temperature-rate at which the crystal takes up energy, i.e., the amplitude of vibration increases. The product of these two factors is then an index of the temperature-rate of volume change. We will assume that each $\frac{\partial \log \Theta}{\partial \log V}$ is a temperature independent quantity. This assumption is reasonable as long as the anharmonicity is small. If all the frequencies show the same volume dependence then $\frac{\partial \log \Theta}{\partial \log V}$ is the same for all of the frequencies. In such a case it reduces to the expression deduced on the basis of Debye's theory. But actually ν_1, ν_2 and ν_3 differ widely in character and their anharmonicities may be supposed to differ just as widely. In such a case the

factors $\frac{\partial \log \Theta}{\partial \log V}$ will not be the same and we can write

$$a = a C_{v1} + b C_{v2} + c C_{v3}, \text{ where}$$

$$a = -w_1 \frac{\beta\theta}{V} \cdot \frac{\partial \log \Theta_1}{\partial \log V}, \quad b = -w_2 \frac{\beta\theta}{V} \frac{\partial \log \Theta_2}{\partial \log V},$$

$$c = -w_3 \frac{\beta\theta}{V} \frac{\partial \log \Theta_3}{\partial \log V}.$$

Since $\frac{\beta\theta}{V}$ varies very little with temperature, we can regard a, b, c as temperature independent quantities. From a knowledge of a, b and c, α could be calculated. Unfortunately there appears at present to be no way of obtaining them. Hence the above equation can be used in a purely empirical fashion by evaluating a, b and c from the observed α values over which the observations of α is free from doubt. If we assume the thermal expansion α to be resolvable into three components, the three constants a, b and c can be evaluated from C_{v1}, C_{v2} and C_{v3} and α at any three temperatures. It should then be possible to represent α as a function of temperature over the whole range of the crystal. The values calculated in this way for lithium are included in the following table. Similar results hold in the case of aluminium, lead and silver. Other details will be published elsewhere.

Lithium, $a = 19.69, b = -5.71, c = 29.7$.

Temp. °A	Calculated Value of $\alpha \times 10^6$	Observed Value of $\alpha \times 10^6$
15°	0.062	no obsn.
60	4.90	no obsn.
90	15.01	no obsn.
100	18.49	18.50
120	24.85	24.45
140	29.32	29.60
200	39.58	39.70
260	45.38	45.00
280	46.19	46.20

In conclusion it gives me great pleasure to record my thanks to Prof. Sir C. V. Raman, kt., F.R.S., N.L., for his valuable help.

M. RAMA RAO.

Poona,

October 26, 1942.

¹ *Statistical Thermodynamics*, by Fowler and Guggenheim.

² Raman, *Proc. Ind. Acad. Sci., A*, Sep. 1941.

DETERIORATION OF ERGOMETRINE SOLUTION

EVIDENCE about the rapid deterioration of liquid extracts of ergot under ordinary conditions of storage in Calcutta laboratories and pharmacies has already been presented from this laboratory.^{1,2,3} As the 'rabbit uterus' method of Broom and Clark⁴ gives clear indication of this loss of potency of ergot extracts, the general presumption is that ergotoxine, $C_{35}H_{39}O_5N_3$, is primarily, if not entirely, responsible. There is little available data regarding the part played by Ergometrine, $C_{19}H_{23}O_2N_3$, which is now considered to be the more important oxytocic constituent of ergot,⁵ in this process of deterioration.

Monthly observations for a period of 9 months (October to June) were made on the potency of two solutions of Ergometrine (Burroughs Wellcome & Co.), one exposed to light and room temperature (maximum 98° F.) and the other kept in dark inside a refrigerator (minimum 42° F.). Colorimetric method of assay as described in B.P. 1932 with later modification in the Addendum, 1936 was employed, a Zeiss Pulfrich Photometer being used for colour comparison.

Ergometrine solution is found to deteriorate in potency to the extent of 60·16% when exposed to ordinary conditions in the light and heat of a pharmacy shelf in Calcutta. Inside a refrigerator, the rate of deterioration is very slow

Table showing deterioration of Ergometrine Solution (0·2 mg./c.c., dil. 1-5)

Date	Inside Refrigerator		Exposed on shelf in Room Temperature	
	Alkaloidal content, mg./c.c.	Loss Per cent.	Alkaloidal content, mg./c.c.	Loss per cent.
22-10-41	0·0482	—	0·0482	—
23-11-41	0·0482	—	0·0411	14·73
23-12-41	0·0482	—	0·0393	18·46
23-1-42	0·0455	5·60	0·0352	26·97
24-2-42	0·0455	5·60	0·0352	26·97
24-3-42	0·0442	8·29	0·0305	36·72
24-4-42	0·0442	8·29	0·0227	52·90
24-5-42	0·0442	8·29	0·0225	53·31
24-6-42	0·0442	8·29	0·0192	60·16

(8·29 per cent.), but is nonetheless not insignificant (see table and graph).

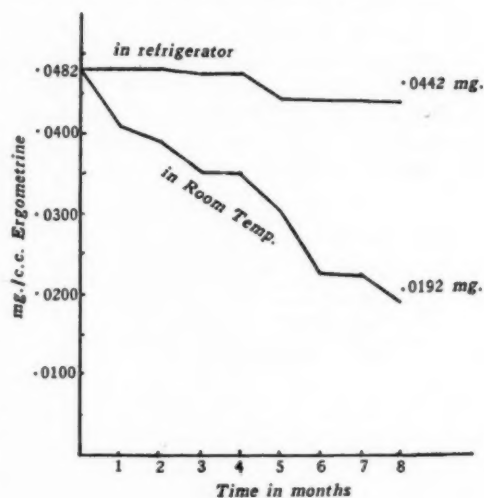


FIG. 1

Rate of deterioration of ergometrine sol.

The work was undertaken by one of us (B. M.) at the suggestion of Prof. J. H. Burn, Pharmacological Laboratory, University of Oxford, England. Further work on the comparative rate of destruction of solutions of ergotoxine and ergometrine is in progress.

N. K. DEY.

I. B. BOSE.

B. MUKERJI.

Bio-chemical Standardisation
Laboratory,

Calcutta and Kasauli (Simla Hills),
110, Chittaranjan Avenue,
Calcutta,
September 28, 1942.

¹ Mukerji, *Ind. Med. Gaz.*, 1938, **63**, 355.

² Bose, Dey and Mukerji, *Trans. Med. Coll. Re-union*, 1941, **4**, 83.

³ —, *Ind. Med. Gaz.*, 1942, **77**, 286.

⁴ Broom and Clark, *Jour. Pharm. Exper. Therap.*, 1923, **22**, 59.

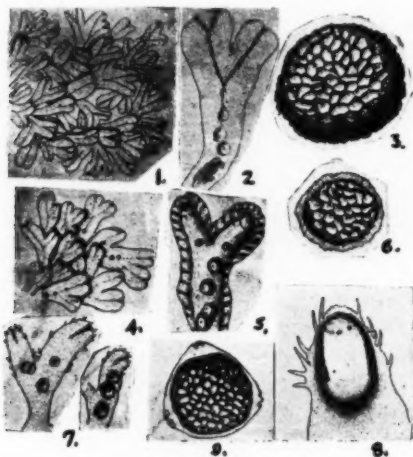
⁵ Dudley and Moir, *Brit. Med. Jour.*, 1935, **1**, 520.

THREE NEW SPECIES OF *RICCIA* FROM INDIA

In a preliminary note¹ the author proposed three new species of *Riccia* from India. A brief account of the morphology and taxonomy of these forms is presented here. The type specimens have been deposited in the Lucknow University Herbarium.

1. *Riccia gangetica* sp. nov.

Monœcious, found in association with *R. himalayensis* St. and *R. melanospora* Kash., thalli isolated or crowded, up to 20 mm. diam., bluish green on the dorsal surface, once or twice furcate, about two to three times as broad as high, with a dorsal median sulcus, air-spaces narrow and slit-like. Ventral scales prominent, semilunar, colourless or pink,



Riccia gangetica sp. nov. (Figs. 1 to 3). 1. General habit sketch $\times 1.7$. 2. Dorsal view of a thallus $\times 4.2$. 3. A ripe spore. $\times 153.2$.

Riccia mangalorica sp. nov. (Figs. 4 to 6). 4. General habit sketch. $\times 1.7$. 5. Ventral view of a thallus. $\times 4.2$ (Rhizoids not shown). 6. Outer face of a ripe spore. $\times 153.2$.

Riccia orientalis sp. nov. (Figs. 7 to 9). 7. Two plants. $\times 4.2$. 8. Apical portion of a thallus from the ventral side. $\times 16.8$ (Rhizoids not shown). 9. Outer face of a ripe spore. $\times 153.2$.

never extending beyond the margin; rhizoids both tuberculate and smooth. Antheridia and

archegonia uni- or bi-seriate along the median line, antheridial papillæ prominent, hyaline, projecting up to 200μ above the surface of the thallus; archegonial neck $273\text{--}328\mu$, upper portion collapsing after fertilisation, lower one becoming golden brown. Mature sporogonia exposed in hemispherical depressions, depressions sometimes confluent due to close juxtaposition; spores ellipsoid, black, $112\text{--}134\mu$ diam., margin obscurely dentate, surface reticulate, low walls separating the areoles which are $11\text{--}16\mu$ in diam., triradiate mark obscure.

Hab.—On damp shady places of old buildings, lawns and fields. Lucknow, Unao and Aligarh. August 1940, *Leg.*—S. Ahmad.

2. *Riccia mangalorica* sp. nov.

Monœcious, thalli delicate, light green, 10×2 mm., thalli overlapping with divergent lobes, having polygonal areas on the dorsal surface, apex emarginate, air-spaces wide as in *Ricciella*, thallus 3-4 times as broad as high. Ventral scales colourless, rarely pink, rhizoids both tuberculate and smooth. Archegonia in one median row, neck $250\text{--}320\mu$, lower part after fertilisation becomes rigid and pinkish. Sporogonia project ventrally, spores winged, dark-brown, $80\text{--}87\mu$ diam., wing $3.6\text{--}7.3\mu$, margin crenate. Areoles $7\text{--}9\mu$ in diam., papillate, papillæ arise from the angles of areoles.

Hab.—On wet mud and damp walls, Mangalore and Bajpai. June 1938, *Leg.* A. R. Rao.

Spores very similar to those of *R. plana* Taylor; may be only a variety of the latter.

3. *Riccia orientalis* sp. nov.

Monœcious, isolated or crowded, $5\text{--}7 \times 0.5\text{--}1$ mm., thalli once or twice furcate, margin with straight or hooked cilia, which are $110\text{--}250\mu$ long, apex emarginate deeply sulcate, twice as broad as high, air-spaces slit-like, ventral scales inconspicuous, prominent only on the apical tubercous part of the thallus. Archegonia in single row, neck $125\text{--}136\mu$ long, basal portion turning pink after fertilisation. Sporogonia prominent on the dorsal surface,

spores dark-brown, winged, triangular, $86-94\ \mu$ diam., wing $3.6-5.4\ \mu$, outer edge entire, except opposite the triradiate mark where it is expanded to $11\ \mu$, spore surface reticulate with inconspicuous papillae at the angles of the areoles. Areoles $10-12\ \mu$ in diam. Triradiate mark conspicuous.

Hab.—Moist soil among rocks, Kumaon Hills (W. Himalayas). October 1936. *Leg.*—S. K. Pandé.

S. AHMAD.

Botany Department,
Lucknow University,
September 10, 1942.

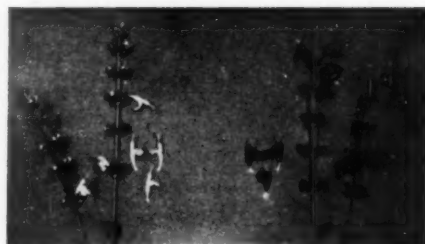
¹ Ahmad, S., *Proc. Ind. Sci. Cong., Baroda*, 1912, 114.

PINK COLOURED MUTANT IN *SALVIA COCCINIA* JUSS EX MURR.

Salvia coccinea is an ornamental plant grown in gardens for its showy flowers. The plant bears a large number of deep scarlet flowers. The flowers of *S. coccinea* are smaller than those of *S. splendens* which is the more commonly grown of the two.

Six years back the author noticed in the ornamental border in his garden a single plant of *S. coccinea* having lighter coloured flowers. The outer colour of the corolla was of an extremely light pink hue, while the inside of the lips was salmon pink. This solitary plant with lighter coloured flowers was noticed amongst nearly three hundred plants with scarlet flowers growing in the border. The few flowers that were present on the pink-flowered plant were selfed and about five seeds were collected. During the next season, out of the five, two seeds germinated and the rest did not. The two plants that grew to maturity bore salmon-pink coloured flowers resembling those of their parent. Since then the progenies of the single plant with lighter coloured flowers have been selfed and multiplied and they have all bred true to the mutant character. The mutation has affected only the colour of the flower and no other plant character.

The accompanying photograph shows the difference in colour between the mutant and the original type from which it has arisen.



A cytological examination of pollen mother-cells and root tips from germinated seeds of the scarlet and of the salmon-pink flowered types showed that they both had the same number of chromosomes, viz., $n=12$ and $2n=24$, thus showing that the difference in their flower colour was due to a mutation affecting the gene controlling the flower colour only.

The chromosome number of *S. coccinea* Juss ex Murr. has been previously reported by Hruby in 1930 as $n=11$, while Sigiura in 1936 has recorded the number $n=10$ for the same species. The number determined by the author ($n=12$) does not agree with the two previously reported numbers for the same species. It is, therefore, probable that the materials examined by Sigiura, Hruby and the author form a heteroploid series with a haploid complement of 10, 11 and 12 chromosomes respectively of the same species.

The author is indebted to Dr. T. S. Raghavan for giving reference to previous reports of chromosome number in *Salvia coccinea*.

L. S. S. KUMAR.

College of Agriculture,
Poona,
October 20, 1942.

¹ Tischler, G., "Pflanzliche Chromosomenzahlen," *Tab. Biol.*, 1934-19, 12 to 16.

STANDARDIZATION AND POTENCY
OF ADRENALINE SOLUTIONS

IN the course of routine assays of drugs submitted to the Biochemical Standardisation Laboratory, one of us (B. M.) noted^{1,2} that several preparations of *Liquor Adrenalinae Hydrochloridi* of the B.P. 1932, which purported to be a 1-1,000 solution, were markedly weaker than this when examined on the blood pressure of 'spinal' cats, a method of assay advocated by Burn³ and also (with slight modification) by the U.S.P. XI.⁴ Since then, more than 200 samples, both of indigenous and foreign manufacture, have been examined in this laboratory with the following results (Table I).

It will be seen that only 139 samples out of

200 conformed with the standard* requirements, the rest being either too weak or too strong for safe therapeutic use (see Graphs 1, 2, 3 and 4).

In view of the rather wide variations in the potency of the adrenaline solutions tested, particularly the finding that certain solutions showed indications of a higher potency (Graph 4) than standard adrenaline solutions (least expected as no pressor amine stronger than adrenaline is yet known), a systematic study of the physico-chemical and biological behaviour of ten representative samples was undertaken to see how far storage can account for the loss of potency observed in certain samples. Table II summarises the findings.

TABLE I

Type of sample	Total No.	Within limit 90-110 %	Above limit more than 110 %	Below limit lower than 90 %
Adrenaline chloride in ampoules ..	32	22 (68.75%)	2 (6.25%)	8 (25%)
Adrenaline chloride in phials ..	86	64 (74.41%)	6 (6.97%)	16 (18.6%)
Adrenaline tartrate in phials ..	82	53 (64.63%)	8 (9.75%)	21 (22.5%)
TOTAL ..	200	139 (69.5 %)	16 (8%)	45 (22.5%)

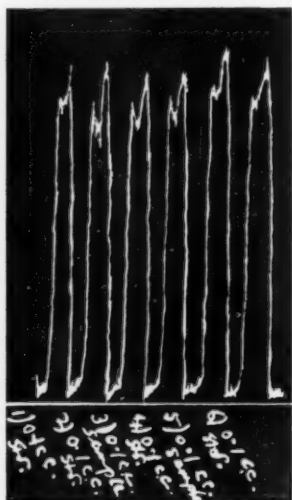
TABLE II

Sample No.	Initial potency per cent.	Period of storage	Potency on re- testing per cent.	Physical characters		
				pH	Colour	Precipitate
1	100.0	1 year 6 months	83.3	1.8	—	—
2	100.0	1 year 5 months	45.5	2.0	—	+
3	105.2	1 year 8½ months	33.3	2.2	+	+
4	120.0	2 years	62.5	1.8	+	—
5	50.0	1 year 4½ months	44.4	1.6	—	—
6	125.0	11½ months	33.3	2.2	—	+
7	50.0	1 year	40.0	2.5	+	+
8	105.3	3 years	105.2	2.0	—	+
9	80.0	2 years 10 months	nil	7.5	+	+
10	97.0	4 years	55.5	2.2	—	—

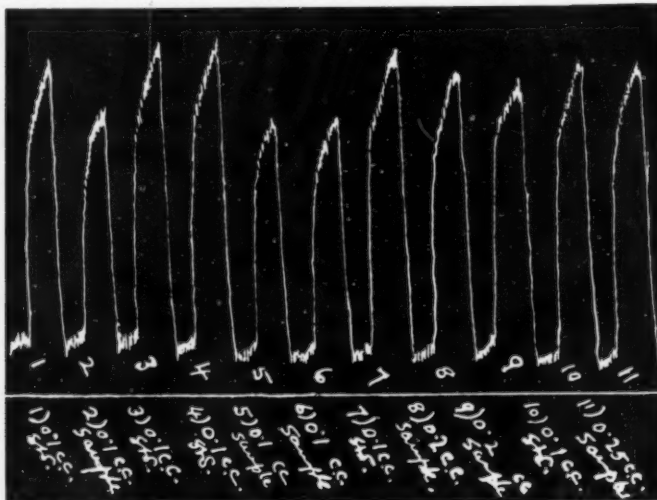
* U.S.P. XI, 1936—"A solution containing, in each 100 c.c. no less than 0.095 gm., and not more than 0.105 gm. of $C_9H_{13}O_3N$ (Epinephrine)." As ± 5 per cent. accuracy cannot always be ensured by the bio-assay method, a slightly higher limit (± 10 per cent.) is allowed here.

The B.P. 1936 lays down a method of preparation of *Liq. Adrenalinae Hydrochloride* but does not specifically state the method of assay to be employed and the permissible limits of error in standardization.

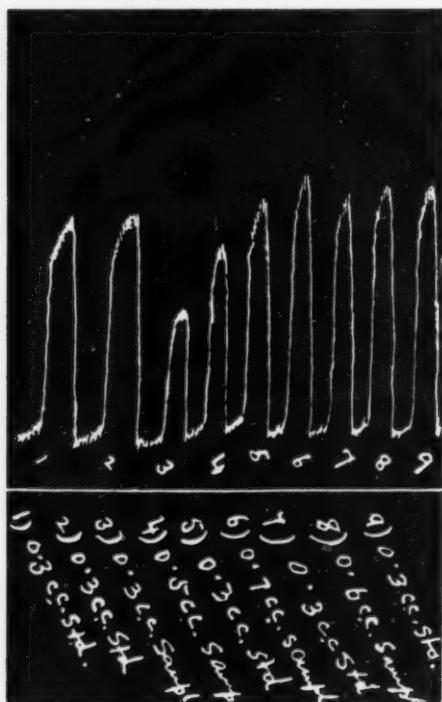
Estimation of Potency of Adrenaline Solutions on Blood Pressure of the Spinal Cat



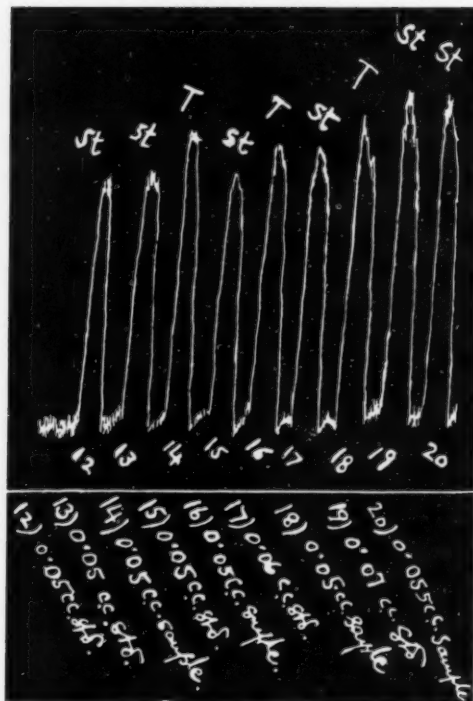
GRAPH 1



GRAPH 2



GRAPH 3



GRAPH 4

Graphs showing estimation of potency of adrenaline by pressure method on spinal cat. Dilution used 1 in 40,000. Injections of adrenaline were given intravenously at intervals of seven minutes. The sample is equivalent in potency to the standard in Graph 1, weaker in Graph 2 (Strength 40 per cent.) and Graph 3 (Strength 50 per cent), and stronger in Graph 4 (Strength 127.27 per cent). Lavo-rotatory natural adrenaline powder obtained from the University of Toronto, Canada (courtesy of Profs. Best and Scott) was used as standard.

It is evident that almost all the adrenaline solutions underwent considerable deterioration on storage and this could not be correlated with factors which are known to facilitate oxidation of adrenaline, e.g., exposure to light, alkalinity of glass containers, pH of the solutions, etc. Thus, in most instances recorded in Table II, the pH of the solutions remained more or less at the optimum level and yet the physiological activity was found to be reduced to nearly 25 per cent. in less than a year's time (Sample No. 6). Only in one instance (Sample No. 9), the pH was on the alkaline side and according to expectation, was found, inactive. The colour and transparency of the solutions, on which considerable emphasis is commonly laid by the official Pharmacopœias and by the medical practitioners in general, were found to be no safe criteria in judging the potency of adrenaline. Sample No. 10, which remained perfectly clear during storage, was found to contain only 55.5 per cent. of its original strength, whereas Sample No. 8, which was slightly brownish and turbid (though no definite precipitate was noted), preserved its activity intact even after three years' storage in the laboratory.

Such findings have naturally focussed attention to the important question whether the factor or factors responsible for the deterioration of adrenaline solutions were not intrinsic in the adrenaline powders themselves from which solutions are being made. Both synthetic and natural adrenaline powders are used by the manufacturers in preparing Liq. Adrenaline Hydrochloride of the Pharmacopœias. Work is in progress in this laboratory in connection with a comprehensive study of the physical (including crystallography and optical rotation), chemical (Folin, Cannon and Denis method⁵ and persulphate method⁶), and biological behaviour of as many brands of synthetic and natural gland powders as can be secured in the Calcutta market. Preliminary analysis of our data appears to corroborate, to a certain extent, the observations of Bose and Ganguli.⁷

It seems clear that adrenaline solutions deteriorate on storage. While all the factors responsible are yet imperfectly known, it seems desirable to enjoin on all manufacturers that the date of manufacture and the date of expiry of potency (Approx. 1 year) be stated on the label of all adrenaline preparations intended for parenteral administrations.

B. C. BOSE.

N. K. DUTT.

B. MUKERJI.

Bio-Chemical Standardisation
Laboratory, Government of India,
Calcutta/Kasauli,
110, Chittaranjan Avenue,
Calcutta,
October 20, 1942.

¹ *Indian Information*, March 1940, 6.

² *Triennial Report, B.S. Laboratory*, 1941, No. 1, 13.

³ Burn, *Biological Standardisation*, Oxford University Publication, 1937, 115.

⁴ —, U.S.P XI, 1936, 207.

⁵ Folin, Cannon and Denis, *J. Biol. Chem.*, 1913, 13, 477.

⁶ Barker, Eastland and Evers, *Biochem. J.*, 1932, 26, 2129.

⁷ Bose and Ganguli, *Curr. Sci.*, 1942, 11, 281.

FURTHER STUDIES ON THE ROLE OF PROTOZOA IN THE ACTIVATED SLUDGE PROCESS

THE ciliate protozoa as a group were found much more efficient in sludge formation and clarification of sewage than any single strain or combination of bacteria that were tried and, among the Ciliata studied, *Vorticella* gave much the best results.¹ It was further observed that the members of the family *Vorticellidae* and those of the closely allied family *Epistylidae* play a special role in the flocculation of sewage colloids, in the process of nitrification as also in the conservation of nitrogen and other fertilising elements in the sludge.^{2,3} More recently, Reynoldson⁴ in England has also confirmed the special significance of *Vorticella*.

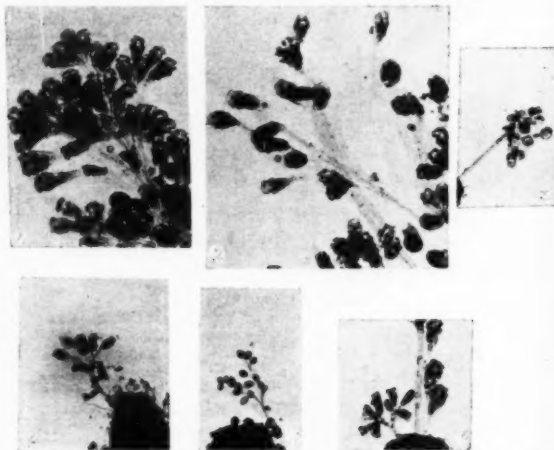
Further investigation into the protozoal activity in the activated sludge tank has revealed the occurrence and development of a number of species of *Epistylis*; not less than half a dozen species of this genus⁵ have been found to flourish in the aeration chambers, forming fluffy masses on the sides of the aeration tanks which treat domestic sewage (Figs.). These forms have also been found to occur in small groups or bunches in activated sludge during aeration, at least 16,000 active individuals per ml.

Extensive experiments have been carried out with these forms of protozoa, by inoculating them in different concentrations into experimental bottles containing varying quantities of raw and sterilised sewage (up to 10 litres) and bubbling air through the suspensions. Comparing on numerical basis, it was found that *Epistylis* was at least twice as efficient as *Vorticella* in clotting and sludge formation, and much more efficient in bringing about the attendant oxidation changes as also in conserving the fertilising ingredients in the sludge. The detailed results will be published elsewhere.

Examination of activated sludge from the different installations in India⁶ has shown that *Epistylis* sp. and *Vorticella* sp. are invariably associated with them. It is of further interest to observe that in the sludge obtained from the aeration tanks at Tuticorin (S. India) in addition to these organisms, *Zoothamnium* sp. (belonging to the family *Vorticellidae*) was also present. The occurrence of *Zoothamnium* in the sludge from Tuticorin is probably traceable to the sea water used there for flushing purposes. Apart from the special significance of the occurrence of *Zoothamnium* in activated sludge in Tuticorin, it is of considerable scientific interest to observe that it is for the very first time that the existence of this organism in India, Burma or Ceylon is being reported.⁷

The peritrichous ciliate protozoa are therefore most important in the activated sludge process in their relation to sludge formation, to the attendant oxidation changes as also to the concentration and conservation of the fertilising ingredients in the sludge. Among the Peri-

tricha, the members of the families, *Epistylidae* and *Vorticellidae* are of the greatest importance, more especially the species of *Epistylis* which



Photomicrographs of the different species of *Epistylis* isolated from the aeration tanks at the Indian Institute of Science, Bangalore $\times 60$.

have been found to thrive best in the aeration tanks throughout the year.

The author thanks Professor V. Subrahmanyam, Dr. Gilbert J. Fowler, Dr. B. R. Seshachar and the late Dr. B. L. Bhatia for their kind interest and assistance in the work.

S. C. PILLAI.

Department of Biochemistry,
Indian Institute of Science,
Bangalore,

October 25, 1942.

¹ Pillai, S. C., *Cur. Sci.*, 1941, **10**, 84.

² —, *Indian Med. Gazette*, 1942, **77**, 118.

³ —, *Proc. 29th Indian Science Congress*, 1942, Part III, p. 196.

⁴ Reynoldson, T. B., *Nature*, 1942, **149**, 608.

⁵ Identification of one of the species has been kindly confirmed by the late Dr. B. L. Bhatia of Lahore as *Epistylis articulata* Fromentel (Private communication dated 18th June 1941); the other species are being further identified; Photomicrographs of the organisms were taken with the kind assistance of Dr. B. R. Seshachar, Central College, Bangalore.

⁶ Samples of sludge from the different Activated Sludge Plants in the country were obtained through the kind courtesy of Dr. Gilbert J. Fowler, Representative of Messrs. Activated Sludge Ltd., in India and the East.

⁷ Bhatia, B. L., "The Fauna of British India, including Ceylon and Burma: Protozoa: Ciliophora," 1936. (Taylor and Francis Ltd., London.)

GERMINATION OF ERGOT

The sclerotia of *Claviceps purpurea* (Fr.) Tul. are nearly cylindrical, slightly curved with longitudinal furrows and externally dark-brown with a yellowish core. The length of the sclerotia imported from Europe varies from 1 to 2 cm.

Several attempts were made to secure germination of these sclerotia. Moist sand was put into petri-dishes and sterilised. After proper sterilization of the outer surface with 1 per cent. silver nitrate solution and subsequent washing with sterilised 2 per cent. NaCl solution, a single sclerotium was dropped into each petri-dish. These petri-dishes were kept in a cold room at 20° C. After an interval of 20 days, four sclerotia were found to have germinated. In one case eight stalked stromata grew out of it, each consisting of a slender, delicate, white stalk terminated by a pinkish

thecia containing asci and filiform ascospores inside.

Subsequently in 1941, samples of sclerotia of *Claviceps* sp. collected in Simla Hills by Dr. Pushkar Nath¹ were obtained through the kindness of Dr. H. P. Chaudhury, Professor of Botany of the Punjab University. These were kept in sample tubes in cold storage at a temperature of 20° C.; in March 1942, one sclerotium out of these germinated after an interval of 7 days, bearing one-stalked stroma. The stalk was very slender and yellowish in colour. The stroma on sectioning showed a number of mature perithecia with asci and filiform ascospores. Unfortunately, further development of ascospores in wheat-agar medium cannot be followed up at present.

Ergot and its preparations are universally employed in obstetric practice. It is also used in a number of other conditions, chief amongst which are migraine and circulatory failure due to shock, etc. Its economic importance, therefore, is very great. As medicinal ergot is not available in India, its successful cultivation in artificial culture media in the laboratory would be a promising scientific and economic contribution.

This work was taken up at the suggestion of Dr. B. Mukerji, Director, Biochemical Standardisation Laboratory, Government of India, Calcutta, and I am thankful to Mr. S. N. Banerjee of the Botany Department, Calcutta University, for the photograph attached.

A. B. BOSE.

Botanical Laboratory,
Carmichael Medical College,
Calcutta,
September 25, 1942.

¹ Nath, Pushkar and Padwick, G. W., *Curr. Sci.*, 1941, 10, 488.

THE EGGS AND EMBRYOS OF *GEGENOPHIS CARNOSUS* BEDD.

No account of either the eggs or embryos of *Gegenophis* exists. The genus is confined to India and is represented by a single species (*G. carnosus*) described by Beddome¹ in 1870.

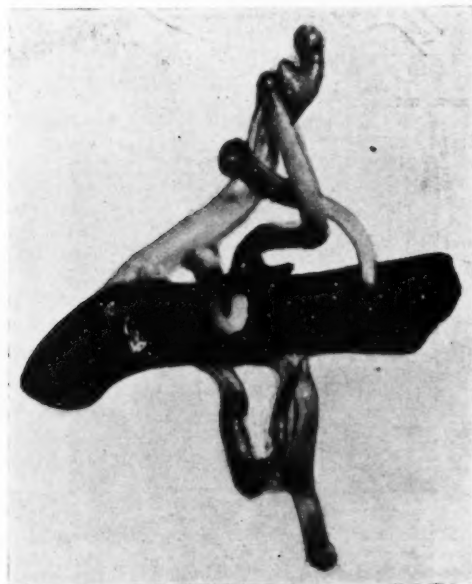
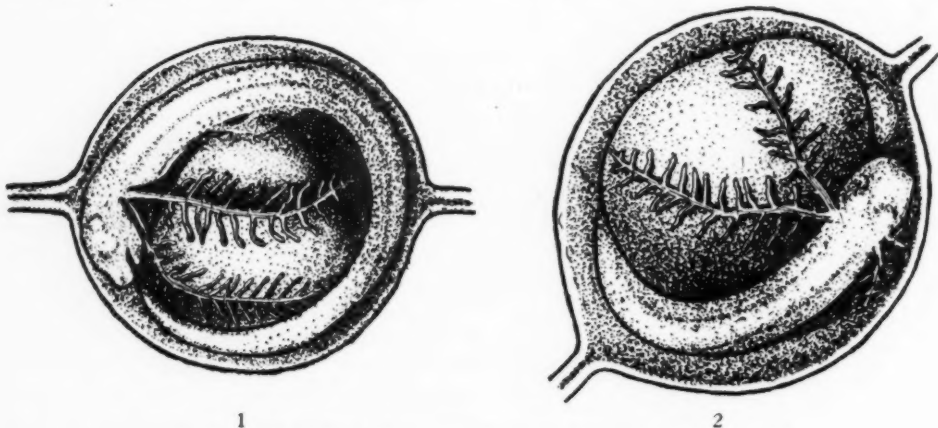


FIG. 1. A number of stalked stromata growing out of a sclerotium of *Claviceps purpurea* (Fr.) Tul. ($\times 4$). globular head—the perithecial receptacle or sphaeridium (Fig. 1). The sphaeridium on sectioning showed a number of flask-shaped peri-

The two specimens which formed Beddome's collection were taken at Wynaad in the Western ghats and were found under stones at an elevation of 5,000 feet. Since then no extensive collection of this species was made; but Dr. L. S. Ramaswami of this University collected a few specimens last year in Trivandrum. A visit to the Travancore forests by the

those of *Ichthyophis glutinosus* figured and described by the Sarasins,² and about fifteen eggs are found in a cluster, the eggs being attached to each other by transparent chazal connections. The chazalæ differ from those of *Ichthyophis* in not being twisted.

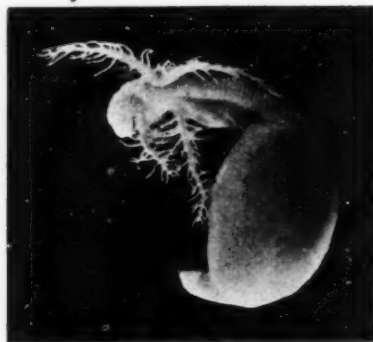
The most interesting feature of the embryos refers to the gills. It is a well-



FIGS. 1 and 2. Eggs of *Gegenophis carnosus* with embryos *in situ*. $\times 3$.



3



4

FIGS. 3 and 4. Embryos of *Gegenophis carnosus* removed from the egg envelopes. $\times 2$.

author in June this year, which was made possible by the kindness of the University of Mysore, resulted in the collection of a very large number of specimens and their eggs. The eggs were taken in burrows by the side of small water courses on the hillside in Tenmalai, Travancore. The egg clusters resemble

known fact that in the Gymnophiona, the gilled stage is passed through in the embryonic condition, and by the time the larvæ hatch out, the gills are altogether lost. In *Ichthyophis* there are three pairs of gills in the embryo, of which the third pair is the shortest. The Sarasins² figure a nearly ripe embryo of

Ichthyophis glutinosus with the yolk almost completely used up and with three pairs of gills. In the embryos of *Gegenophis carnosus* that I have in my possession there are only two pairs of gills of almost equal length, the third pair being either completely absent, or represented as in a few embryos, by a very small stump. It is premature to say whether the third gill pair is ever developed in *Gegenophis* but it is possible that the third and the smallest pair of gills is reduced even further in *Gegenophis* till it is either completely absent or does not make its appearance till very late in embryonic development.

B. R. SESHACHAR.

Department of Zoology,
Central College,
Bangalore,
November 10, 1942.

¹ Beddome, R., *Madras Monthly Journ. Med. Sci.*, 1870, 2, 176.

² Sarasin, P. and F., *Erg. Naturwiss. Forschungen auf Ceylon*, 1887-1890, 2.

A NEW NEMATODE CAMALLANUS SALMONÆ FROM KASHMIR

RECENTLY I had an opportunity of examining two gravid female nematodes of the genus *Camallanus* recovered from the intestine of *Salmo* sp., in Kashmir. One of these was so much mutilated that it served no useful purpose, and consequently I had to make observations on the single specimen at my disposal. Two species of this genus have so far been recorded from fish in India, viz., *C. anabantis*^{1,2} and *C. sweeti*.³ Salmon is for the first time observed to be infected with such worms.

Camallanus salmonæ n. sp.

The specimen exhibits cuticular striations and two pairs of cephalic papillæ. Each of the buccal valves contains 15 longitudinal ridges without beads. Tridents are definitely wanting. The tail is finger-like and elegantly rounded, and its tip is without any spine. No papillæ in the caudal region were observed. The vulva is placed almost in the middle of

the body and there is a very slight cuticular expansion in the vulvar region. The nerve ring is placed at a distance of 0.21 mm. from the anterior extremity. The measurements in millimetres of different parts are given below:—

Total Length—12.

Maximum breadth of the body—0.38.

Length of the capsule—0.14.

Breadth of the capsule—0.15.

Length of the muscular

œsophagus—0.39.

Host—*Salmo* sp.

Location—Intestine.

Locality—Kashmir.

A comparison has been made here between *C. salmonæ* and other species of *Camallanus* parasitising various fishes. According to Lewaschoff⁴ the number of ridges on the buccal capsule in *C. lacustris* is 25, whereas *C. salmonæ* possesses only 15. In the female *C. ancyloides*⁵ the tip of the tail is bluntly conical, the tridents are well developed, and the body length greatly differs from that of *C. salmonæ*. *C. oxycephalus*⁵ differs from my species by its body length as well as by the possession of tridents. The size of *C. cotti*⁶ is very small and the tridents are also present. *C. wolgensis* differs from the present worm by the encirclement of vulva by lobular ridges, by the development of tridents and also by its body length. According to Pearse⁷ the gravid females of *C. anabantis* are wanting in tridents, but those reported from India by me² exhibit well-defined tridents, and it has been suggested in that paper² that the specimens of Pearse should be re-examined. Moreover, in *C. anabantis* the body length is extremely small and the tail ends conically with 2 or 3 small spines. In *C. trichogasteræ*⁷ again the tail ends in a pair of minute spines. Lastly *C. sweeti*³ differs from *C. salmonæ* by its body length, possession of spines at the tip of the tail, vulva having prominent lips and ridges on the buccal valves being beaded.

On the basis of the aforesaid differences I consider that my specimen deserves a new

specific rank and I propose to it the name
Camallanus salmonæ n.sp.

G. K. CHAKRAVARTY.

Zoology Department,
University of Calcutta,
September 6, 1942.

¹ Chakravarty, G. K. *Science and Culture*, 1937, **3**, 298.

² —, *Ibid.*, 1939, **5**, 317.

³ Moorthy, V. N., *Journ. Parasit.*, 1937, **23**, 302.

⁴ Lewaschoff, von M., *Zeits. f. Parasitenk.*, 1930, **2**, 123.

⁵ Ward, H. B., and Magath, T. B., *Journ. Parasit.*, 1916, **3**, 57.

⁶ Fujita, T., *Jap. Jour. Zool.*, 1927, **1**, 169.

⁷ Pearse, A. S., *Journ. Siam. Soc.*, 1933, **9**, 179.

STATE OF CHLOROPHYLL IN THE CHLOROPLAST

THE study of chlorophyll in relation to the chloroplast is important since it is now recognised that the activity of chlorophyll cannot be ascribed to its nature alone but seems to depend upon its state in the living plastid. It is generally held that chlorophyll exists in a state of intimate association with both protein and lipoids of the chloroplast.¹ Experiments conducted by the authors on the fluorescence of chloroplasts and of pure chlorophyll led to a support of the above hypothesis.

Fluorescence of Chloroplasts.—Chloroplasts were isolated in a normal and uninjured state from the leaves of *Phaseolus vulgaris* following Granicke's² method. These were colloiddally dispersed in water and the fluorescence studied before and after the addition of the zymes *trypsin* and *lipase*. The fluorescence measurements were made with the Zeiss Pulfrich Photometer using the British Hanovia quartz lamp as a source of ultra-violet radiation. Results in a summarised form are given in Table I.

Colloiddally dispersed chloroplasts showed a distinct fluorescence; the property was lost upon the addition of the protein splitting enzyme *trypsin* or the fat splitting enzyme *lipase*. It therefore appears that in the living chloroplast the chlorophyll exists in a state of intimate association with both protein and

TABLE I
Fluorescence of chloroplasts and of pure chlorophyll under different conditions

Experimental material	Fluorescence
A	
1. Chloroplasts colloiddally dispersed in water	+
2. Chloroplasts colloiddally dispersed in water and treated with <i>trypsin</i> for 8 hours	—
3. Chloroplasts colloiddally dispersed in water and treated with <i>lipase</i> for 8 hours	—
B	
4. Pure chlorophyll colloiddally dispersed in water	—
5a. Solution of pure chlorophyll in 80% ethyl alcohol	+
b. Solution of pure chlorophyll in 80% ethyl ether	+
6a. Solution of lecithin chlorophyll	+
b. Sol of chlorophyll added to sol of lecithin	—
c. Sol of chlorophyll added to lecithin solution	—

lipoids and the property of fluorescence is exhibited by the chloroplast only when the chlorophyll is in such a state of association in the chloroplast.

Fluorescence of Chlorophyll.—Fluorescence of colloidal suspensions of pure chlorophyll in water and of the sols of chlorophyll in lecithin as also that of the solutions of chlorophyll was studied. Suspensions of chlorophyll were prepared by dissolving the required quantity of the pure pigment in 1 c.c. of acetone and adding 99 c.c. of distilled water. For preparing the sol of lecithin chlorophyll, about 300 mg. of lecithin were dissolved in 15 c.c. of alcohol, mixed with an equal quantity of chlorophyll solution in absolute alcohol and the requisite quantity of water added and the suspension dialysed in a stream of pure water. The dialysed suspension did not contain alcohol.

No fluorescence was noted in an aqueous suspension of chlorophyll (Table above, B), while solutions of chlorophyll showed fluorescence. Only colloidal suspensions of lecithin chlorophyll showed fluorescence while chlorophyll sol added to lecithin sol or chlorophyll sol added to lecithin solution did not show any fluorescence.

The experimentally noted presence of protein and lipoids in the chloroplast,³ the solubility of chlorophyll in lipoids and the formation of fluorescent sols of chlorophyll with lipoids and the loss of fluorescence of the living chloroplast on the destruction of its protein and lipoids by the enzymes as noted in the present work, all point to the possibility that in the chloroplast the chlorophyll may be dissolved in a lipid; this is colloiddally dispersed over the proteinaceous groundwork of the chloroplast leading thereby to an intimate association with both protein and lipoids.

The bearing of these results on the discussion of the structure of chloroplast will appear elsewhere.

B. N. SINGH.

N. K. ANANTHA RAO.

Benares Hindu University,
August 10, 1942.

¹ Weier, *Bot. Rev.*, 1938, 4, 497.

² Granick, *Amer. Jour. Bot.*, 1938, 25, 558.

³ Neish, *Biochem. Jour.*, 1939, 33, 203.

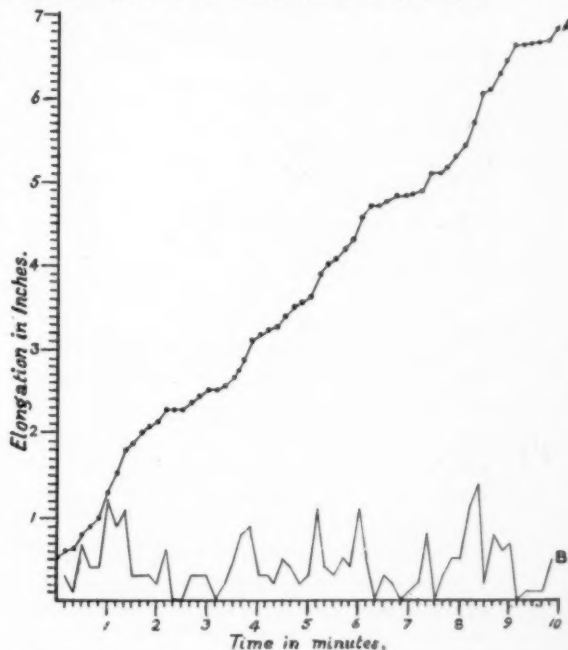
VARIATION IN THE RATE OF ELONGATION OF THE COLEOPTILE OF *ZEa MAYS*

SEVERAL investigators have studied the rate of growth in many plants, but no attempt has yet been made to record this activity at short intervals. Friesner (1910)¹ who happens to be the first man to record 'rhythm' in growth mentions about the occurrence of 2 to 4 distinct 'oscillations' in the rate of growth during a period of 24 hours. The present note of the author is an attempt to show that these fluctuations or 'oscillations' in the rate manifest themselves even at short intervals of a minute or less instead of appearing only at long intervals of a few hours.

The Coleoptile of *Zea Mays* is selected for the present note although the seedlings of several plants have been studied. The illumination was artificial and directly from above. A sufficiently long time was given to enable the seedling to adjust itself to the room conditions before recording was started. The room tem-

perature was uniformly about 74° F. during the short period of observation. The readings were taken at intervals of 10 seconds with a magnification of about 3000.

Graph A shows the elongation of the coleoptile during a period of 10 minutes. Graph B shows the rate of elongation, but here the magnification is about 12000 to make the rate clearer. From B it is noticed that the rate is



Graphs to show the elongation and the rate of elongation of the coleoptile of *Zea Mays*.

A. Elongation of the coleoptile. $\times 3000$.

B. Rate of elongation of the coleoptile. $\times 12000$.

not uniform even during the brief period of observation, but is given to a series of fluctuations. There are several peaks in this graph, these generally appearing at intervals ranging from 30 seconds to a minute. The author² has already explained a similar variation in the turgidity of the plant body at short intervals. The autonomous activity of the growing organs showing a pulsating nature (Bose, 1927)³ and the rhythmic change of potential in the plant body at short intervals as explained by Bose (1923)⁴ might also

indicate the occurrence of variation in the turgidity of the plant body even at short intervals. The author is inclined to believe that probably a similar variation in the turgidity might account for the fluctuation in the rate of elongation of the coleoptile.

A detailed paper dealing with this activity in *Cicer*, *Dolichos*, *Phaseolus*, *Pisum* and *Zea Mays* will be published later on.

C. V. KRISHNA IYENGAR.

Department of Botany,
Intermediate College,
Mysore,
November 6, 1942.

¹ Friesner, R. C., *Amer. Jour. Bot.*, 1920, **7**, 380-406.

² Krishna Iyengar, C. V., *Jour. Mys. Univ.*, 1942 a. **3**, 23-38.

³ Bose, J. C., *Plant Autographs and Their Revelation*, London, 1927.

⁴ —, *Physiology of the Ascent of Sap*, London, 1923.

MANUFACTURE OF GLANDULAR PRODUCTS IN INDIA: PREPARATION OF ADRENALINE FROM SUPRARENAL GLANDS

THE number of publications from different laboratories and institutions in the country, which have recently been appearing in your columns on this subject, affords ample evidence of the keen interest which has been aroused in the public in the subject. I am, therefore, tempted now to publish this short note on the commercial preparation of Adrenaline from glands, if only to correct some misconceptions which appear to prevail in certain quarters. One of the criticisms levelled against the proposal for investigating the possibilities of manufacturing natural Adrenaline in the country that has come to my notice, appears to be that Adrenaline isolated from natural sources is never pure, whereas with the synthetic product one can always be certain of its purity. This criticism is really quite unfounded. The gland extracts undoubtedly contain many foreign substances—some of them still of unknown composition—but the experiments carried out in my laboratories during the past few months

have shown definitely that, by the careful handling of these extracts, products can be obtained, which, even in the crude stage, analyse to more than 80 per cent. of purity. These products, moreover, lend themselves readily to further purification, the purest product having the correct melting point (212° C.) and optical rotation (−52°). The yields, too, of the pure product are quite satisfactory. The synthesis of Adrenaline can perhaps be a commercial proposition in India, only in times of peace, when the intermediate chemicals, which are essential for this synthesis, such as Catechol, Chloracetyl Chloride, etc., can be imported at cheap rates. At the present moment, however, we have no option but to fall back on the resources available in the country. I may perhaps point out that even in Europe and America the synthetic product has not been able to replace entirely the natural product. On the other hand, there are good reasons to believe that the Adrenaline manufactured from the products of the organised packing houses of Chicago and other cities in the U.S.A. is definitely cheaper than the synthetic compound. I may further mention that the information, which has been supplied to me, through the kind help of the Board of Scientific and Industrial Research of the Government of India, appears to show that the mobilisation of the raw material from the slaughter houses of, say, 10 of our large cities in India, might lead to the production of sufficient Adrenaline, not only for the civilian consumption, but also for the present military emergencies. Our efforts should, therefore, be all in the direction of organising and pooling our resources, and, I believe that if we succeed in doing it effectively, India can not only be self-sufficient as regards her requirements of this important drug, but may even have a surplus for export to less favoured countries like China and others.

B. B. DEY.

Presidency College,
Madras,
November 4, 1942.

REVIEWS

Fundamentals of Vibration Study. By R. G. Manley (with a Foreword by Dr. W. Ker Wilson). (Chapman & Hall, London), 1942. Pp. xii + 128. 13s. 6d.

This is a neat little volume to which the budding mathematicians, preparing for the first university degree in this country, can turn for a pleasant and profitable holiday in an easy chair. In books of engineering mathematics the symbolic operations cease to appear as pure abstractions in their logical nakedness; they look as concrete and real as the dashpot, the shaft and the wheel and the engineer is usually instructed to handle them as such. However much the pure mathematician may protest against this rough handling he cannot deny that it has led to a successful exploitation of the routine in Nature and also to a fundamental control over Nature's forces. It is very much to be desired, therefore, that a student of mechanics who loses his zest for the subject, in the prevalent atmosphere of fictitious problems, should take up a simple and easy book like Manley's to see how some practical problems of engineering are solved.

The publisher's blurb, which consists of a part of the Author's Preface, brings out very clearly that the book is not a university text-book and that it is intended for technicians whose knowledge of mathematics does not very much extend beyond the matriculation syllabus of a British university. Dr. Wilson's Foreword rightly emphasizes the importance of vibration research in the modern problems of transport and elsewhere. The book itself consists of six chapters running over 96 pages and, contrary to the expectations raised by the title, only mechanical vibrations are discussed. Systems of one, two and many degrees of freedom and even continuous systems are gradually introduced. Damping and forced vibrations are explained at an early stage and the useful concepts of dynamic and torsional stiffness and effective inertia are elucidated with graphs and figures. Elements of elasticity and the Fourier series constitute the most difficult topics introduced here. The reader for whom the book is intended may find himself out of his depth here. Alive to this

difficulty, the author has provided three appendices which are of the nature of running commentaries on vectors, determinants, bending of beams, etc. There are 22 exercises with answers in the end. A bibliography introduces some well-known university texts. The index is quite exhaustive.

One misprint which the reviewer has noted is in the last formula of p. 16 where an overhead dot is missing. On p. 13, the 'finite solution' is mentioned. It should be the 'finite-period solution'. On p. 56 'dynamic theorem' is printed instead of 'dynamical theorem'. On p. 99, where vectors are defined, it should have been pointed out that, in addition to having direction and magnitude, vectors must obey the parallelogram law of addition. But these are minor blemishes. The book is both concise and precise and it should not fail to attract and profit those for whom it is intended.

V. V. NARLIKAR.

Organic Chemistry. By P. B. Sarkar and P. C. Rakshit. (H. Chatterjee & Co., Ltd., Calcutta), 1942. Pp. vi+562. Price Rs. 5.

There are not many Indian publications on theoretical organic chemistry, and the authors are to be congratulated in bringing out this neat little volume, which appears to be admirably suited to the requirements of the B.Sc. (Pass) students of our universities. The essential principles of organic chemistry are given clearly and succinctly so that they may be easily followed by the beginner. The opening chapter deals with the scope and definition of the subject, and the characteristic features of carbon compounds. The inclusion in this part of a short account of the history of development of theories of organic chemistry, together with the accounts of work of some of the pioneers in this subject, would have been an improvement. The usual methods of purification of organic compounds, and of detection of elements and their quantitative estimations, together with the common methods of arriving at the formulae of compounds, have been dealt with in the two succeeding chapters. The chapter dealing with valency is rather too brief, and it is unfortunate that the electronic theory, which is now so well

established and lavishly used for the interpretations of structures of both inorganic and organic compounds, should have been omitted almost entirely. It is very desirable that this be included in a future edition, as the elementary students should be given an opportunity, whenever possible, of representing the important compounds, such as nitro-paraffins, nitriles, etc., by electronic formulæ. These have been found to help very considerably in removing the difficulties of the beginner in understanding their peculiarities.

Descriptive organic chemistry commences from the sixth chapter with hydro-carbons, both saturated and unsaturated. The chapter on halogen derivatives should perhaps have followed the chapter on alcohols, from which most of the others are derived. The chapter dealing with alcohols has been written ably; in view of the importance of "power alcohol" at present, a short description of the modern method of manufacturing absolute alcohol by the azeotropic distillation process could have been profitably introduced.

The treatment of the matter and its arrangement in the book are both quite satisfactory. Experimental details for preparing most of the important carbon compounds have been given, and, if details of some of the important reactions are also included, the treatment would have been complete. The book is sure to be very profitable for the students preparing for the degree examinations in chemistry of our universities.

B. B. D.

Recent Advances in Sex and Reproductive Physiology (Second Edition). By J. M. Robson. (J. A. Churchill Ltd., London), 1940, Pp. xii + 329. Price 15s.

Fully appreciating the value of results of recent research, the author has revised the first edition of his book published in 1934. A noteworthy feature of the book is that large sections have been rewritten and "new chapters have been added on the properties of the male hormone and other androgens, on the chemistry of the gonadic hormones and on the methods used in the standardisation of the sex hormones". It would be in the fitness of things to state that the book constitutes a worthy contribution to our knowledge of the subject. The book is well got up and is bound to stimulate further research on various aspects of the physiology of reproduction. Whilst commending its use by the clinicians, the volume is strongly

recommended for an intensive study by mammalian embryologists and physiologists.
A. S. R.

Practical Histology and Embryology. By Nellie B. Eales. (Macmillan & Co., Ltd., London), 1940. Pp. vii + 111. Price 3s. 6d. net.

This little volume on practical histology and embryology is written by an experienced investigator and teacher, with the object of presenting to the pupils and teachers alike, the simple methods in micro-technique which the author has employed with excellent results. The subject-matter is dealt with in two parts. Part I embodies an easily comprehensible account of the structure of simple tissues, glands and tissue complexes. Before proceeding to deal with embryology the author introduces, wisely enough, the student to sections of representative regions of the rabbit embryo. In Part II important features in the development of the frog, the chick and the rabbit are described. The illustrations in both Parts I and II have been selected with great care. The appendix contains the formulæ for the preparation of the commonly employed physiological saline solutions, macerating fluids, fixatives and stains. This low priced handy volume is strongly recommended for use by the students of the pre-clinical classes in medical colleges and the degree classes.

A. S. R.

Dravyamu-Sakti (Matter and Energy) in Telugu, Part I. By Vasanta Rao Venkata Rao, M.Sc., Maharaja's College, Vizianagaram, 1942. Demy 16mo. Pp. 102. Price As. 8.

This booklet explains in simple, homely, non-technical language, in Telugu, the salient points in the subject of "Matter and Energy". It is the third in the series of popular science publications by the author in book form, of the articles contributed by him to the Telugu Journal *Bharati*, having for its object the spread of up-to-date scientific information among the masses. How far he has been successful in his praiseworthy attempt is not known. In the present publication the author prepares the ground for giving to the layman, in later articles, some idea of Broadcasting and kindred subjects of present-day interest. He begins with the old world idea of the molecule and the atom, explains the periodic law of the elements and leads the reader on to the modern conception of the atom,

of which he gives a vivid picture. Then follows an explanation of waves and wave-motion and a description of the penetrating rays beginning with X- and ending with the Cosmic Rays.

The facility with which the author handles his subject is really noteworthy, his simple, homely language not betraying any labour on his part to explain scientific ideas not easy of comprehension even by an intelligent literate public not conversant with the elements of physical science. We wish that the author may be enabled to effect further improvements by giving more detailed explanations of the elements of physical science and by adding neat illustrative sketches.

B. V.

Administration Report of the Madras Government Museum and Connemara Public Library, 1941-42. (Madras Government Press), Pp. 21. Price As. 6.

Of the four chief duties of a museum, collection, conservation, investigation and exposition, the second necessarily assumes abnormal importance in time of war, especially in a coastal city such as Madras,

leaving much less opportunity than usual for the others. This Report shows, however, that while every effort is being made for the security of the collections (though the public galleries necessarily suffer temporary depletion thereby), progress is nevertheless being made in other directions. Popular lectures have been given and have been well attended in spite of the black-out, educational work in connection with schools has continued, and "Bulletins" have been prepared on "Shells and other Animal Remains found on the Madras Beach" (published), "Amaravati Sculptures in the Madras Government Museum" (published since the Report was prepared), "Catalogue of Roman and Byzantine Coins" and "Irravati and Culture Change". The appendices include a complete list of treasure trove finds for the year and of a good number of notable acquisitions. Reading in the Connemara Public Library has decreased somewhat, but this is fully compensated by, and no doubt in large measure due to, increased borrowing of books. It is good to see that both Museum and Library have been so successful in continuing their service in the face of present difficulties.

INDIAN MEDICAL GAZETTE

Special Tuberculosis Number, October 1942

NEARLY the whole of this issue is devoted to publications on tuberculosis by workers in India. There is an editorial on the subject and twelve articles by different workers. Two further articles are held over for the November number. The increasing interest and importance of surgical treatment of tuberculosis is shown by the publication of three articles on thoracoplasty treatment. Benjamin and Frimodt-Møller report on 150 cases operated upon during the last nine years. Clinically, 46.7 per cent. were much improved and 22.7 per cent. improved. In 39.3 per cent. of cases the sputum became negative. The operative mortality was 9.3 per cent. within one week and 14 per cent. within the first two months. A study is made of the influence on the results of age, sex, side affected, general condition, blood examination, type of lesions and size of cavities, and the reasons for any failure in closure of cavities are discussed. It is found that contralateral disease, if not too extensive, is not a contraindication to operation. The need for the co-operation of different agen-

cies in arranging for thoracoplasty treatment is stressed. The type of operation now used is the modern type performed in two or three stages, two or three ribs being removed each stage, the two upper ribs being removed first.

S. K. Sen describes in detail the development of thoracoplasty operations and the technique of the modern operation, the article being well illustrated. Of twenty-one cases operated on, the mortality rate was 14.25 per cent. and in general the results have been good.

G. Samuel writes briefly on ten patients treated by bilateral thoracoplasty with no mortality and "very encouraging results".

Artificial pneumothorax is discussed in two articles. P. K. Sen and K. N. De present the analysed records of 500 cases treated as out-patients (because of the lack of sufficient inpatient accommodation) at the Medical College, Calcutta, with particular reference to the danger to the contralateral lung. In theory this danger is serious. The analysis showed that of the 500 cases before treatment the contralateral

lung was normal in 270 and affected in 230. The normal lung developed lesions in 23 per cent. of cases during treatment. The affected contralateral lung improved in 33.5 per cent., remained stationary in 39 per cent. and progressed in 27.4 per cent. The results are not unsatisfactory. The influence of age, sex, type of lesions, etc., on the results of treatment are discussed.

G. Samuel discusses extra-pleural pneumothorax treatment and the frequency with which infection occurs in the extra-pleural space. These infected pockets are best treated by thoracoplasty, and two such cases are reported with good results. Death occurred in two other cases not operated on.

A. C. Ukil discusses the pathology, symptoms, diagnosis, treatment and prognosis of intestinal tuberculosis. The disease is found to be rarely primary and is usually secondary to tuberculosis of the lung. The importance of early diagnosis, in which X-ray examination plays an important part, is stressed.

Riaz Ali Shah analyses the findings on 973 cases of tuberculosis in North India and compares his findings of those of a similar analysis of 2,021 cases made in somewhat different circumstances by Benjamin in South India. "Benjamin's results led him to the conclusion that in Indian patients the disease is of a very serious type; it is acute, rapidly developing, with little tendency to show a natural resistance and healing. That the disease prevailing among our people is predominantly acute in type seems to be well established. The present study confirms it. But the very serious view that Benjamin has taken does not seem to be justified in the population of India generally." In the discussion a view is expressed that the relative severity of tuberculosis in India is caused not by first-infection tuberculosis occurring in adult life, but chiefly by environmental factors.

Benjamin discusses the after-histories of tuberculous patients after treatment, in view of the statement made by some workers in other countries that "the prognosis of the average case of pulmonary tuberculosis has not materially changed during the past thirty years." The records of 3,945 patients, five years after treatment are analysed, but 39 per cent. of patients were untraced. The cases are grouped in four five-year periods from 1916-1920 to 1931-1935.

"While immediate results of treatment have shown definite improvement in all the five-year periods since 1915, a corresponding improvement in after-histories is not observed except that all the five-year periods since 1920 show better results than the period of 1915-1920."

The proper after-care of patients is shown to have a definite influence on survival.

S. K. Mallik, Het Ram Aggarwal, and Ram Lal Dua report on an investigation of the types of bacilli causing extra-pulmonary tuberculous lesions in the Punjab, such lesions in other countries being commonly due to the bovine type of organism. In the Punjab, however, of 39 strains of bacilli isolated from such lesions, 37 on inoculation into rabbits gave the typical human type of reaction. No bacilli of bovine type were isolated.

I. E. J. David writes an account of the work of the tuberculosis clinic, Nagpur, and thinks that such work can be an important agency in the control of tuberculosis in India. He emphasises, however, how much the work needs to be extended.

B. S. Kanga, however, writing from Bombay, considers that such lines of work accomplishes little or nothing, and recommends that in cities, tuberculous patients and their families shall be isolated in health chawls providing separate accommodation and proper medical supervision for the patients and for their families.

C. L. Sahni reports on a tuberculin survey in Sialkot town. Six thousand four hundred and thirty-six children in 32 schools in the town were tested. The details of the technique are given and the results of the test are analysed. The incidence of positive results rose from 17.7 per cent. in children aged five, to over 40 per cent. in those over seventeen. Practically at all ages, girls gave a higher incidence of positive results. The proportion of positive results was higher in schools in areas with poor sanitary conditions, but in one good residential school for girls in a good situation, the incidence was abnormally high. The positive results were more common in Muslims and Christians than in Hindus.

The reports section abstracts from the reports of the King Edward VII Sanatorium, Bhawali, for the year 1941, and the Third Annual Report of the Tuberculosis Association of India for the year 1941.

J. LOWE.

CENTENARIES

Hoffmann, Friedrich (1660-1742)

FRIEDRICH HOFFMANN, German doctor, was born at Halle in Saxony in 1660. His ancestors had been practising medicine for nearly two centuries. Friedrich was started on mathematics as a preparation for a medical career. Later he studied chemistry and became a very popular lecturer in the subject, even while he was studying medicine at Jena. Frederick the king of Prussia appointed him as the first professor of medicine at the University of Halle which he founded. His work in the university soon brought him international fame, and he was elected an honorary member of several learned bodies including the Royal Society of London. The king himself invited him to be one of his courtiers. But the envy and jealousy concomitant to court life drove him back to his university within a period of three years.

Hoffmann had a lucrative practice as a doctor. His 'Anodyne liquor' brought him quite a fortune. He was in the habit of using a few simple remedies; he even used to tell his patients "If you wish to preserve your health, avoid doctors and medicines." Hoffmann was a prolific writer. His collected works extend to eleven folio volumes. He was one of the first to go beyond the humoral theory of pathology then widely prevalent. His famous work was the *Medicine rationalis systematica*, in 9 volumes. It occupied him twenty years.

Hoffmann died November 12, 1742.

Strutt, John William (1842-1919)

JOHN WILLIAM STRUTT, third Baron Rayleigh, a British physicist, was born at Maldon, Essex, November 12, 1842. Though his early education was frequently interrupted by illness traced to his having been a seven months' child, he went to Cambridge in 1861 and took his tripos course under E. J. Routh. Senior wranglership, Smith's prize and a fellowship of Trinity, fell to him easily in 1865.

He succeeded as third Baron Rayleigh in

1873. This diverted his attention to agriculture for a while. Psychic research was another subject that fascinated him at that time; but he soon found that no definite conclusion could be obtained in the field. In 1876 he, therefore, returned to orthodox scientific work. In 1879 he succeeded Clark-Maxwell as Cavendish professor of experimental physics. In 1884 he resigned this post and began the pursuit of his researches in his own private laboratory at Tarling.

The *Treatise on the theory of sound* was published in 1877 and it holds the field, even now as an unrivalled classic. His first paper was published in 1869 under the title *Some electromagnetic phenomena considered in connection with the dynamical theory*, and it initiated a uniform flow of about nine papers per annum until the total number reached 446, five days before his death. They occupy six volumes of the collected papers.

The redetermination of the absolute electrical units was one of the routine items of work which he completed in his Cavendish days. His experimental determination of the densities of gases brought to him the collaboration of Sir William Ramsay and the pursuit of seeking an explanation for the different densities—differing by .1 per cent.—of two samples of nitrogen culminated in the discovery of Argon in 1895 and secured the Nobel Prize for the joint authors in 1904. He played no small part in the establishment of the National Physical Laboratory. But perhaps even more than the brilliance of his discovery or the far-reaching effect of the establishment of this laboratory, it is the thoroughness and clearness of his exposition and the flair of his writings that will make the future generation turn back to him again and again.

Rayleigh died June 30, 1919.

S. R. RANGANATHAN.

University Library,
Madras,
November 5, 1942.

SCIENCE NOTES AND NEWS

Polarisation of Light Scattered by Isotropic Opalescent Media.—In a recent paper (*Journ. Chem. Phys.*, 1942, 10, 415) Francis Perrin has extended the reciprocity theorem in colloid optics given by Dr. R. S. Krishnan (*Proc. Ind. Acad. Sci.*, 1938, 7, 21) to the general phenomenon of scattering by any isotropic medium. Using Stokes' linear representation of the polarisation of light beams and the very general law of reciprocity he has shown that in any isotropic medium the scattering through a given angle and for a given wave-length is characterised by ten independent coefficients. In the case of a symmetrical medium four of these coefficients are zero, leaving only six scattering coefficients. The well-known reciprocity relation (namely $V_H = H_V$) derived by Dr. Krishnan, forms a special case of this generalised treatment. In this interesting article the author has called attention to the reality of the Krishnan effect and also to the importance of detection of ellipticity as a test for "multipolar scattering". In this connection it is interesting to recall the fact that such elliptic polarisation has been detected and measured in the light scattered by emulsions (Darbara Singh, *Proc. Ind. Acad. Sci.*, 1942, 15, 406) and by silver sols and binary liquid mixtures very near the critical solution temperature (Hariharan, *Proc. Ind. Acad. Sci.*, 1942, 16, 278 and 283).

Dehydration of Foods.—One of the earliest methods of preserving foods, especially animal foods like meat and fish, was by salting and partial drying. Such a treatment, though partially checks deterioration of foods, alters their character to a great extent. In modern food storage such as canning and mechanical refrigeration, emphasis is laid on maintaining as nearly as possible unchanged the original taste and nutritive value. Both canning and mechanical refrigeration, though they prevent deterioration of foodstuffs, the former always necessitates their cooking while the latter involves a use of elaborate equipment to obtain low temperature throughout the chain of distribution, which causes considerable transport difficulties, especially in times of war. Now, in all countries at war, great attention is being given to drying of foodstuffs, as a means not only of preserving them, but of reducing their weight and bulk, thus facilitating ease of transport. In dehydration of foodstuffs, it is important to control temperature and duration of drying and also storage in air-tight containers in order to obtain a product retaining full palatability and nutritive value of the original sample. Thus, e.g., cabbage not only retains its original colour on drying under controlled conditions, but contains actually more vitamin C as revealed by large-scale tests than the fresh sample. It is hoped that these observations will result in a much wider use of this method of food preservation everywhere in the world in future.—(Summary of B.B.C. talk given by Dr. Franklyn Kidd on "Dehydration of Foods".) K. B.

Vitamins A and D Content of Fish Liver Oils.—In view of the increased demand for natural sources of vitamins A and D, Pugsley *et al.* (*Canad. Jour. Res.*, 1942, 20, 167 D) have made a preliminary survey of the oils obtained from two varieties of fish, namely, shad and mackerel, caught in the Maritime Provinces of Canada. They have presented data on the percentage of liver and intestines in the fish, percentage of oil in body, liver, intestines and offal, and the vitamins A and D potency, iodine value, and percentage of unsaponifiable matter in these oils.

It is significant that the values obtained for vitamins A and D in the case of mackerel liver oil are within the limits of those reported for halibut liver oil, while the shad liver oil approximates the potency of authentic cod liver oil. The body oil of both fish is devoid of vitamin A. The intestinal oils of mackerel are relatively high in vitamin A but low in vitamin D. S.R.S.

Sugarcane Wax.—As a supplement to the note on sugarcane wax which appeared in this *Journal* (1942, 11, 379), it is to be added that experiments conducted by K. A. N. Rao and G. N. Gupta at the Imperial Institute of Sugar Technology, Cawnpore (*Proc. 10th. Ann. Con. Sugar Tech. Assoc. India*, 79) on the extraction of the wax on a commercial scale have shown that "Solvent Oil" b.p. 75-135°C., obtainable from Messrs. Burmah Shell Co., is both an effective and economical solvent. The wax is recovered in 9.94 per cent. yield and the solvent loss is only 7.5 per cent. The wax compares very favourably with carnauba or beeswax in its properties. Removal of the wax does not in any way affect the properties of the sugarcane mud for preparation of compost.

The Indian Lac Research Institute.—Dr. Shanti Ranjan Palit of the Indian Lac Research Institute has published three interesting papers on shellac. The first one, *Technical Note No. 7*, deals with a simple method for the preparation of pure resin from shellac. Ethyl acetate free from water and alcohol has been found to dissolve out the soft resin leaving the pure resin almost undissolved. It has been shown that this method can be adopted for large-scale operation as well, benzene being added subsequent to the addition of ethyl acetate to facilitate economic recovery of the solvent entrapped within the swelled pure resin. The softening and melting points of the pure resin obtained by this procedure are given. The second paper, *Bulletin No. 46*, deals with the relationship between solvent-power, gelation-capacity and viscosity of shellac solutions in mixed solvents. Viscosities of shellac solutions in a mixture of two non-solvents, the mixture possessing good solvent power, or of one solvent and another non-solvent, have been studied in a detailed manner over a wide range of concentrations. A new method for evaluating the solvent power of different solvents for lyophilic solutes has

been indicated. The third paper, *Bulletin No. 48*, treats about the solvent-solute relationship of resins in mixed solvents. The author finds that resins behave in a way fundamentally different from all ordinary solutes with respect to their solubility and that if a resin be dissolved in a non-solvent with the help of a 'solubiliser', the higher the proportion of the resin to the non-solvent, the smaller the quantity of 'solubiliser' needed to bring about complete solubility.

A. V. S.

The Jurassic Rocks of Cutch.—In his presidential address to the Geology Section of the last Indian Science Congress (a copy of which we have only just received), Dr. Raj Nath, Professor of Geology, Benares Hindu University, deals with the recent work on the Jurassic rocks of Cutch and its bearing on some problems of Indian Geology. These rocks have now been known to Indian geologists for more than 70 years and their importance has always been recognised not only because of their highly fossiliferous character, but also on account of their association in places with the fresh-water Upper Gondwana beds, thus furnishing a means of fixing the upper age limit of the Gondwana system. After presenting a brief review of the older work on these rocks, Dr. Raj Nath proceeds to give a summary of the recent researches in this field, which might be said to have begun during the years 1924-27, with his own detailed investigations in the field and Dr. Spath's work on the ammonites from these beds. The several beds comprising the four main divisions of the Jurassic rocks of Cutch—the Patcham, the Chari, the Katrol, and the Umia—have been investigated in great detail by the author, and an elaborate scheme of classification and correlation of the entire series, taking into consideration all the available stratigraphical and palaeontological evidences, has been proposed and the same compared with those of other workers, in the form of a tabular statement. Regarding the age of the associated Gondwana beds Dr. Raj Nath thinks that the upper age limit of the Gondwana system represented by the Umia stage of Cutch, should be placed at about the middle Cretaceous period.

The address concludes with an appeal for a better and fuller appreciation of the cultural interest and economic importance of the study of geology in schools and colleges, in the following words: "The prosperity of a country depends largely upon its mineral wealth, and I need not emphasize the importance and the need for systematic researches to be carried out for the proper utilisation and conservation of India's mineral wealth. Let us hope for the early advent of the period when the importance of geology to mankind will be properly realised in this country."

Vinegar from Sugarcane and Fruit Juices.—

In an article appearing in the October 1942 issue of *Indian Farming*, S. C. Datta and S. C. Biswas discuss in a semi-popular manner an improved method for the production of vinegar than hitherto available. The method consists of boiling the raw material (cane juice, over ripe fruit extract, gur) with an initial sugar

percentage of 18, in earthen or stone jars and inoculating and incubating them firstly with a pure culture of yeast or a yeast starter like toddy or mohua flowers. During the fermentation period which lasts four to six days the jars are kept agitated to prevent mould infection. At the end of the alcoholic fermentation, as noticed by the cessation of frothing the acetic starter is added. This is prepared by the addition of equal quantities of vinegar and fermented liquid and left undisturbed for the formation of the scum or the "Mother of Vinegar". The acetic fermentation is carried out in the shallow earthen utensils and the vinegar matures under these conditions in about 30 days. With an initial sugar content of 16 to 18 per cent. the authors report 7.9, 7.6, 7, 7.5 per cent. alcohol and 6.5, 6.7, 6 and 6.6 per cent. acetic acid production with cane juice, over-ripe banana and jack fruit extracts and 20 per cent. gur solution, respectively.

Review of Sugarcane Research.—We are happy to announce that Sir T. S. Venkatraman has agreed to the request of the Governing Body of the Imperial Council of Agricultural Research to undertake a comprehensive review of sugarcane research in India, as subsidised by the Council, and to make recommendations with regard to future research to secure the greatest development of India's potentialities.

The scope of this inquiry will include the consideration of the areas in which sugarcane cultivation should be encouraged, the suitability of varieties selected for cultivation in different areas, and the extent to which they have been spread, the possibility of preparing a schedule of practical instructions for cultivators in different regions, the control of pests, and fungus diseases, and the practical application of knowledge already acquired.

The following students of the Imperial Agricultural Research Institute, New Delhi, have been awarded the Diploma of the Institute (Assoc. I.A.R.I.) after the completion in September 1942 of their two years' post-graduate courses and the acceptance by the Institute Council of theses submitted by them:—

Botany.—U. Thein Aung, M. V. Vachhani, Hari Kishore and H. P. Srivastava.

Agricultural Chemistry.—N. M. Bose, M. C. Chhatrapati and P. Thothadri.

Entomology.—T. D. Mukerjee, K. K. Nirula, Anantaram Panda, A. Seshachalapathi Rao and R. K. De.

Mycology.—U. N. Mohanty and Ali Sabir Fatmi.

Sugarcane Breeding.—Syed Majid Ali and Sohan Bir Singh.

The following students have successfully completed the one-year post-graduate course in Agriculture: Ajit Singh Dhesi and Abdul Rahim Khan.

SEISMOLOGICAL NOTES

During the month of October 1942, five slight and one great earthquake shocks were recorded by the Colaba seismographs as against one moderate and ten slight ones recorded during the same month in 1941. Details for October 1942 are given in the following table:—

Date	Intensity of shock	Time of origin I. S. T.	Epicentral distance from Bombay	Co-ordinates of the epicentre (tentative)	Depth of focus	Remarks
		H. M.	(Miles)		(Miles)	
6	Slight	13 21	5670	..	..	Slightly deep.
9	Slight	22 16	3340	..	..	..
21	Great	05 52	3640	..	110	Epicentral region, near Leyte (Philippine Islands).
25	Slight	15 05	2160	..	..	..
27	Slight	03 39	4890	..	68	..
30	Slight	12 48	1450	..	..	..

MAGNETIC NOTES

Magnetic conditions during October 1942 were more disturbed than in the previous month. There were 12 quiet days, 16 days of slight disturbance, 1 of moderate disturbance and 2 of great disturbance as against 16 quiet days, 12 days of slight disturbance and 3 of moderate disturbance during October 1941.

The quietest day during October 1942 was the 22nd, while 28th was the day of largest disturbance.

The individual days were classified as shown below:—

Quiet days	Disturbed days		
	Slight	Moderate	Great
1, 6, 7, 8, 16, 17, 21-24, 26 and 27	3-5, 9, 10, 11-15, 18-20, 25, 30 and 31	29	2 and 28

Two moderate storms were recorded during October 1942 as compared with three moderate disturbances during October 1941.

The mean character figure for the month of October 1942 was 0.77 as against 0.58 for the same month last year.

A. S. CHAUBAL.

We have pleasure in inviting the attention of our readers to an advertisement inserted by Messrs. The Mysore Chemicals and Fertilisers, which appears elsewhere in this issue. Through this medium they will, from time to time, announce their products which, it is hoped, will meet the pressing requirements of research and industry.

We acknowledge with thanks receipt of the following:—

"Journal of Agricultural Research," Vol. 64, No. 11; and Vol. 65, No. 2.

"Agricultural Gazette of New South Wales," Vol. 53, Nos. 9 and 10.

"Indian Journal of Agricultural Science," Vol. 12, Pt. 4.

"Journal of Chemical Physics," Vol. 10, Nos. 7 and 8.

"Indian Forester," Vol. 68, No. 11.

"Transactions of the Faraday Society," Vol. 38, Pts. 6-8.

"Indian Farming," Vol. 3, No. 9.

"Genetics," Vol. 27, No. 4.

"Quarterly Journal of the Geological, Mining and Metallurgical Society of India," Vol. 14, Nos. 3 and 4.

"Transactions of the Mining, Geological and Metallurgical Institute of India," Vol. 38, No. 1.

"Review of Applied Mycology," Vol. 21, No. 7.

"The Bulletin of the American Meteorological Society," Vol. 23, No. 4.

"Indian Medical Gazette," Vol. 77, No. 10.

"Nature," Vol. 150, Nos. 3792 and 3799.

"Journal of Nutrition," Vol. 24, No. 1.

"Canadian Journal of Research," Vol. 20, Nos. 6 and 7.

"Science," Vol. 96, No. 2482.

"Indian Trade Journal," Vol. 147, Nos. 1894-97.

"Sky," Vol. 1, Nos. 9 and 10.

"Science and Culture," Vol. 8, No. 5.

BOOKS

Handbook of Physical Constants and Mathematical Tables. By T. N. Seshadri. (S. Viswanathan, 2/10, Post Office Street, Madras), 1942. Pp. iv + 48. Price As. 12.

A Handbook of Shellac Analysis. By M. Rangaswami and H. K. Sen. (Indian Lac Research Institute, Namkum, Ranchi), 1942. Pp. xiii + 106. Price Rs. 3-4-0.

ERRATA

Vol. 11, No. 10, October 1942

Page 394, para 2, lines 13 and 14, for "2.4-4.0 mg.", read 0.24-0.40 mg."

Page 393, first column, line 10, for "fall" read "rise".

4
-
e
i,
",
",
0,
1.
g
1,
d
1.
7.
-
0,
7.
2-
1-
2.
M.
ac
2.
11"